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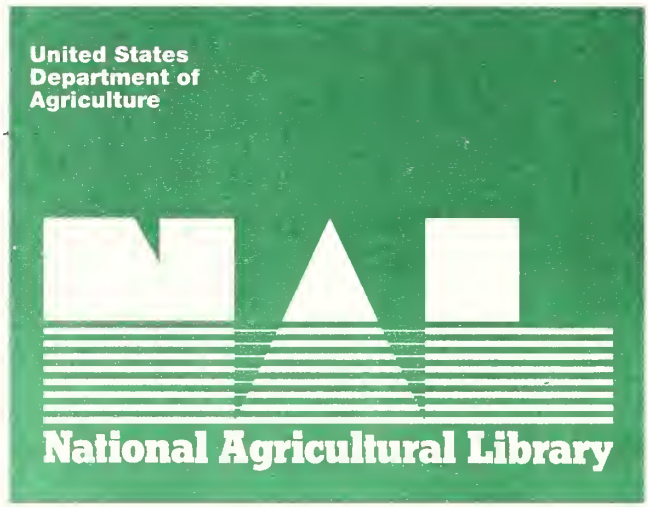
# Final Environmental Impact Statement for the Pocket/Baker Ecosystem

Long Valley Ranger District
Coconino National Forest



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# FINAL
# ENVIRONMENTAL IMPACT STATEMENT

# POCKET-BAKER ECOSYSTEM

## COCONINO COUNTY, ARIZONA



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Lead Agency: USDA Forest Service

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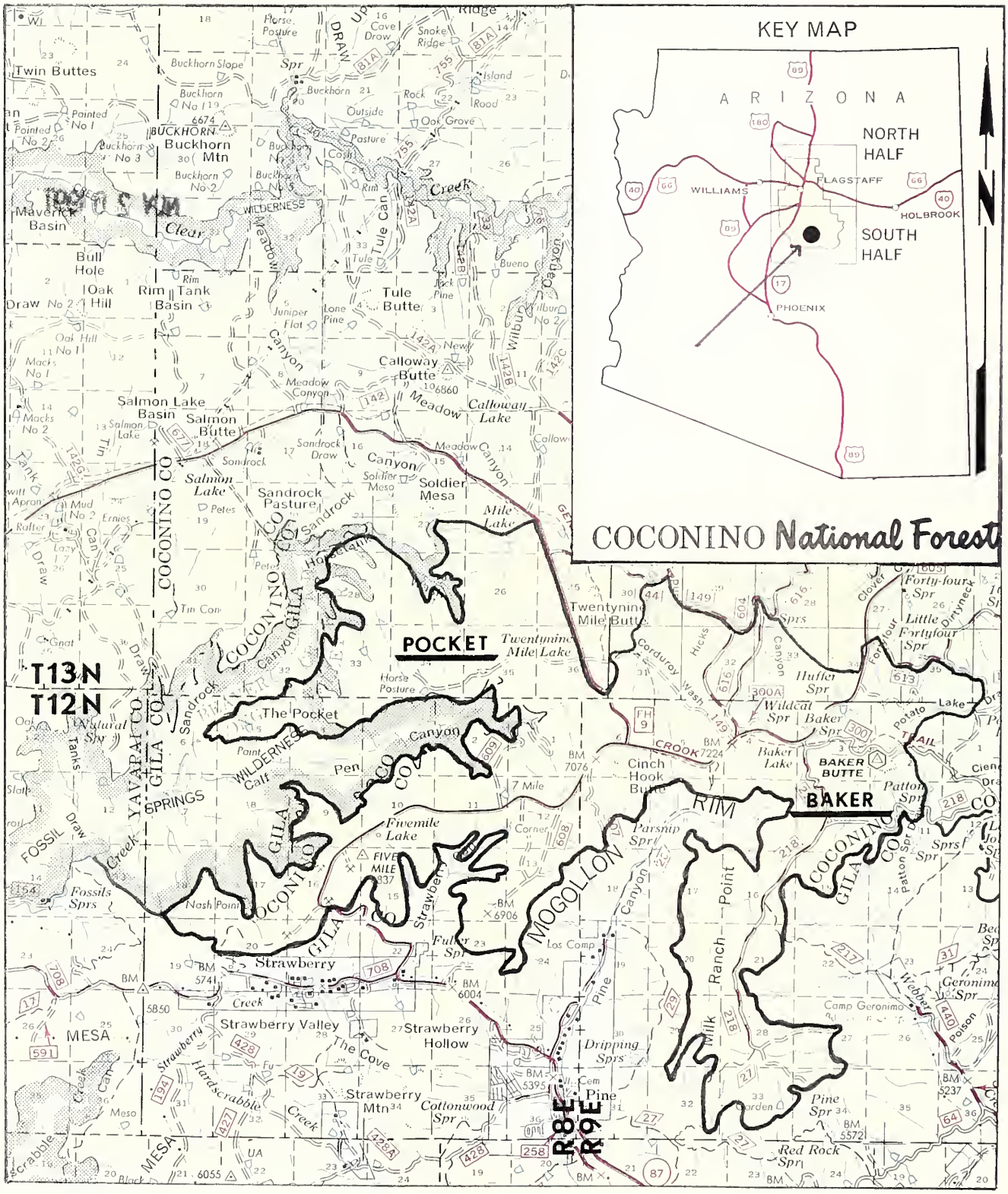
The Coconino National Forest proposes a management strategy for the Pocket-Baker Ecosystem. This plan is needed to correct existing conditions in vegetation, range management, watershed and soil, transportation system and safety, and forest fuel and wildfire potential. Management of this approximate 23,000 acre area is made difficult by the existence of high levels of southwestern dwarf mistletoe and the habitat needs for the Mexican spotted owl. This area also contains some of the heaviest fuel loadings on the Long Valley District and poses a potential wildfire threat to and from the communities of Pine and Strawberry, Arizona.

Six alternatives have been considered for the management of this area. These are (1) Resource Changes Focusing on Interim Directive #2 for the Mexican Spotted Owl; (2) Resource Changes Focusing on Aggressive Treatment of Dwarf Mistletoe; (3) Resource Changes Focusing on Uneven-aged Timber Management; (4) No Action Alternative and Curtailing Livestock Grazing; (5) Resource Changes Focusing on Continuing Livestock Grazing as a Current Activity; and (6) Resource Changes Focusing on Refinements from Comments to the Draft EIS. Alternative 6 is presented as the preferred alternative.

A Draft Environmental Impact Statement was available for comments between May 30 and July 15, 1995. Changes between the Draft and the Final Environmental Impact Statement are the result of public comments to the Draft and the completion of the Recovery Plan for the Mexican Spotted Owl.

# POCKET/BAKER VICINITY MAP



# SUMMARY
of the
# ENVIRONMENTAL IMPACT STATEMENT
for the
# POCKET-BAKER ECOSYSTEM

The Environmental Impact Statement (EIS) for the Pocket-Baker Ecosystem describes a Preferred Alternative and alternatives to the Preferred Alternative for management of forest lands within the Pocket and Baker 10K analysis areas. This EIS incorporates the standards and guidelines of the Coconino National Forest Land and Resource Management Plan (1988), and its subsequent amendments, which direct the overall management of the Coconino National Forest.

## ISSUES

The final issues for which the alternatives were designed are:

- **The absence of fire in the ecosystem.**

  Less than 10% of the Pocket/Baker area has been burned within the last 15 years. Lack of fire in the pine forest results in an increase in tree density and forest fuels, a decrease in herbaceous and shrub production, and a disruption of organic matter processing and nutrient cycling. Reintroduction of cyclic burning is made more difficult by heavy fuel loading and air quality standards that limit the amount of days that burning can occur. Potentially catastrophic wildfires like the Bray and Dude fires of 1990 could occur along the Mogollon Rim above and around the communities of Pine and Strawberry.

- **Lack of vegetative seral stages and diversity.**

  The majority of the pine trees are young with diameters generally from 9-18 inches (approximately 80% of the area). Past management resulted in removal of the old trees and simplifying the vertical vegetative structure to dominantly young to middle-aged sized trees. Snag removal practices up until the early 1980's combined with the timber harvest of large trees has resulted in a shortage of existing and recruitment trees for snags.

- **Developing and sustaining old growth tree structure.**

  Since many of the ponderosa pine sites are heavily infected with southwestern dwarf mistletoe, stands with moderate to high levels of dwarf mistletoe will not develop into quality old growth conditions. Young trees (about 80 years old) with current high infection levels will likely succumb to mortality within 50 years. Therefore, the greater the proportion of young trees in a given stand, the more difficult it will be to develop dense canopy, unevenage conditions or old growth in the long term.

Old growth tree structure is preferred not only by the Mexican spotted owl, but also by the majority of Coconino National Forest wildlife species. With 47% of the Pocket/Baker area in moderate to high dwarf mistletoe rating, the crux of this issue is how much and what kind of treatment is needed now, while maintaining current wildlife habitat needs and providing for sufficient habitat in the long term. With nearly 75% of the study area being in critical habitat for the Mexican spotted owl, potential impacts seem greatest to this wildlife species.

Harvesting trees now to reduce dwarf mistletoe for more vigorous future stands will modify the canopy closure and may result in an adverse impact to the Mexican spotted owl. The consequence of no treatment may also result in adverse affects, because after 30-60 years a reduction of canopy will likely occur, declining suitable nest/roost habitat or preventing new nest/roost habitat from being reached. In addition, delaying treatments now will increase future costs and reduce future options for maintaining desired vegetative structures.

- **Decline of aspen.**

  The 18 occurrences of aspen (most less than an acre in size) are declining for several reasons. Lack of fire is retarding aspen sprouting and increasing the effects of competition from grasses and other tree species. Large elk populations seek out the young aspen shoots limiting reproduction success. The harsh treatments to stimulate aspen reproduction are expensive (elk proof fencing) and visually displeasing (heavily cut patches), especially along well travelled corridors.

- **Increasing demand for recreational activities.**

  The expressed need for an increased variety and amount of yearlong recreational activities is increasing faster than the ecosystem can handle. This demand manifests itself in unsafe or resource damaging activities such as snowplay at Cinch Hook gravel pit, off-highway vehicle use on road 608, and camping in compaction-sensitive meadows.

- **Watershed and safety problems with the transportation system.**

  Many forest roads lay within the confines of stream courses or their filter strips inhibiting the watershed from properly transporting water. Some roads are not within stream courses, but have improper drainage structures causing erosion and sedimentation. In addition, the road density is well above Forest Plan guidelines.

  State highway 87 has 6.7 miles of hazardous conditions, ranging from trees that can fall into the roadway to areas of dense, young trees that shade roads creating long-lasting ice patches. Roadside clearings that grow grasses and forbs conducive to animals will attract deer and elk resulting in potential encounters with vehicles.

Concerns raised through scoping and responses to the Draft EIS were also incorporated into the various alternatives. The major concerns are:

***Mexican Spotted Owl.*** All alternatives should meet the guidelines of the MSO Recovery Plan. Sections in the EIS dealing with MSO management guidelines prior to the Recovery Plan are confusing and not appropriate. It is more important to recover the owl in the short term than worry about habitats in the future, especially with a lack of long term studies on the effects of dwarf mistletoe to owl habitat. Meeting the guidelines includes retaining all trees over 18 inches in diameter.

***Livestock Grazing.*** The range of alternatives for livestock management is not adequate. Livestock grazing has been greatly responsible for the current dense condition of the forest. And while some respondents wanted livestock grazing excluded, others wanted more improvements and alternate grazing systems for the improvement of livestock grazing practices. Some respondents expressed that the effects of competing elk were not adequately stated, or that the elk herd is too large.

***Cumulative Effects.*** Cumulative effects were not displayed and/or addressed properly, especially the effects of past timber harvesting and livestock grazing.

## ALTERNATIVES

Six alternatives were developed for the Pocket/Baker ecosystem area to address the resource needs and the issues raised from the Proposed Action and the Draft EIS. Evolving management direction for the Mexican spotted owl during the Pocket/Baker analysis played a key role in the design criteria for the alternatives.

**Alternative 1** proposes resource needs based on a landscape ecosystem analysis of the area utilizing the management direction in Interim Directive #2 for the MSO. In addition, biological opinions on other projects regarded *dispersal habitat* as an important item, and the opinions heavily reflected protecting such habitat. This alternative includes prescribed fire on approximately 17,000 acres; restoration of 50 acres of scattered aspen sites; reduction of vegetative hazards along State Highway 87; implementation of improved range management for the next 10 years; treatment of dwarf mistletoe infected sites by timber harvest on approximately 5,650 acres; and partnerships to restore Forest Service road 608 and reopen Cinch Hook snowplay area for safe winter recreation. Alternative 1 was sent to the public for comments as the Proposed Action (February 1, 1994).

**Alternative 2** is the same premise as Alternative 1 except the treatment of dwarf mistletoe is on a much more aggressive scale, utilizing shelterwood seedcutting to a greater extent. All the same projects as Alternative 1 occur except timber harvest occurs on about 6,800 acres. The limited area available for harvest in Alternative 1 creates increasing acreage where pines are declining in vigor and growth. Realizing that dispersal habitat guidelines tended toward single-species management by limiting needed treatments, the Team developed Alternative 2 to provide and maintain desired vegetative stand structures in a broader ecosystem approach.

**Alternative 3** is the same premise as Alternative 1, but scales back the amount of seed cut harvests and emphasizes uneven-aged prescriptions. The same projects are proposed as Alternative 1 except timber harvest occurs on about 4,200 acres. When the MSO became listed as a threatened species, the Fish and Wildlife Service provided the Forest Service with draft guidelines for management within proposed critical habitat. Realizing that neither existing Alternative 1 or 2 met these guidelines, Alternative 3 was designed to implement recommendations of the Draft MSO Recovery Plan and thus not adversely affect proposed MSO critical habitat. The Draft MSO Recovery Plan limited the acreage that could be harvested within any given decade.

**Alternative 4** is the No Action Alternative as required by the National Environmental Policy Act regulations. Selection of this alternative would mean that current management of all resources will continue except that livestock grazing will cease when the permit expires in 1999. This alternative serves as a baseline for comparison of all alternatives.

**Alternative 5** is the same as Alternative 4 *except* that livestock grazing will continue. This action renews the permit for about the next 10 years under the current grazing scheme. The Calf Pen allotment is grazed by 47 cattle every year, while the Baker Lake allotment is grazed every other year by about 84 cows and two horses.

**Alternative 6** is a further refinement of the preferred alternative presented in the Draft EIS for Pocket/Baker. It presents the same projects as Alternative 1 except timber harvest occurs on about 5200 acres. **This is the preferred alternative**. There were both clarifications and differences between the Draft and the Final MSO. Therefore, not all of the assumptions on which Alternative 3 was based remained valid. Alternative 6 was created as a modification to the Preferred Alternative (#2 in the Pocket/Baker DEIS) to meet all of the criteria established by the Mexican Spotted Owl Recovery Plan and in compliance with the Regional Spotted Owl and Northern Goshawk EIS for the Amendments to the Forest Plans.

## CONCLUSIONS

In response to the issues and the comments from other agencies and interested publics, the Interdisciplinary Team reached the following conclusions:

- There is a conflict between the maintenance of current stand densities and treatments needed now to set into motion the stand characteristics that will create unevenage and/or old growth habitat for replacement nest/roost MSO habitat. In order to achieve desired tree sizes, tree canopies, and unevenage tree structure, the effects of dwarf mistletoe on tree growth must be reduced.

- Before wildfire can be allowed to burn naturally (prescribed natural fire) without causing substantial damage to existing vegetation, reductions in both tree density and forest fuels needs to occur.

- Thinning by logging controls which trees are to be removed. Thinning by moderate fire intensity produces a random loss of trees, including larger sized trees. Thinning by low intensity fire produces almost no thinning.

- Excluding livestock as a means to reduce tree density will not be effective, because most forested sites are already heavily stocked with young to middle-aged trees. Site conditions are no longer as open and conducive to heavy pine regeneration. In addition, thirty years of logging, thinning, prescribed fire, and changes in grazing management have substantially reduced the dense thickets of trees produced earlier this century.

- Of the 435 species of wildlife which can occur on the Coconino National Forest, 50% of them use the ponderosa pine to meet some or all of their needs. The wildlife appear to use all size/age/structure groups of trees, but with a greater emphasis on the more mature and old growth structures. The mature and old growth forest in Pocket/Baker is seriously lacking.

## ENVIRONMENTAL EFFECTS

The major environmental consequences are:

- Nutrient cycling, reduction of wildfire hazard, enhancement of fire dependent species, reduction of dwarf mistletoe, and thinning in seedling thickets are greater for Alternatives 1/2/3/6 than Alternatives 4 and 5. Given that the burning prescription minimizes undesirable effects, soil productivity is maintained or enhanced. Key wildlife habitat components (snags, dead and down logs) will also be maintained. Therefore, no significant effects are expected from burning to soils, water quality, and wildlife species.

- Alternatives 1/2/3/6 (by virtue of timber harvest) alter the proportion of acres within the young to middle-aged stands of pine substantially when compared to Alternatives 4 and 5. In 20 years, Alternatives 1/2/3/6 result in a greater amount of middle-aged stands than Alternatives 4 and 5. Within-stand diversity among the action alternatives is greatest in Alternative 2; Alternative 6 has the best balance of vegetative structures after 20 years.

- All alternatives, except 3, meet the guidelines of the MSO Recovery Plan. Alternative 3 reduces existing pine-oak nesting/roosting habitat by 116 acres. There is a reduction of potential nesting/roosting and foraging habitat for the northern goshawk immediately after implementation of Alternatives 1/2/3/6, but there is virtually no difference in habitat conditions in 20 years among all the alternatives. Due to mobility of goshawks and the lack of occupied goshawk habitat, there is little if any affect to goshawks.

- Time controlled grazing (Alternatives 1/2/3/6) will result in increases in plant vigor and diversity. With reduced pasture size, livestock will be concentrated in smaller areas, which will force the animals to graze plants that otherwise would not be selected. This will lessen the impacts on plant species (compared to Alternative 5) that livestock prefer. The uniform plant use and recovery will benefit Mexican spotted owl prey base species through improved food and cover availability. Regrowth of the grazed pine bunchgrass community will be more palatable to big game species, particularly elk. This palatable regrowth is expected to take pressure off historic grazing ungulate concentration areas. In the short term, the continuance of the current grazing scheme under Alternative 4, until 1999 when livestock grazing will cease, will maintain the current grass and forb diversity and vigor. Then, as livestock are no longer grazed, plant diversity and vigor should increase, particularly with any proposed broadcast burning. Because the existing pastures are very

large, there is very little control over livestock use in Alternative 5. Both overgrazing and under-utilization will continue. The result of both over- and under-utilization is a reduction in the amount of organic material which results in the decline of soil productivity. The percentage of cool season grasses will increase as a result of the selective grazing by cattle, and the length of time cattle are in a particular pasture.

- Untreated sites of low dwarf mistletoe infection levels will continue on a pace to reach moderate infection levels; untreated moderate infection level sites will continue on a pace to reach high infection levels; and untreated high infection level sites will continue to increase in dwarf mistletoe intensity, with increasing mortality (mostly within smaller trees), and an eventual decline in canopy density. Therefore the greater the acres on which dwarf mistletoe is reduced, the lower the overall infection level for the analysis area and the more opportunities there are to manage the vegetative structure. Alternative 2 reduces dwarf mistletoe the most; however, Alternative 2 also results in the most open forest canopy. In 20 years, Alternatives 2 and 6 provide the greatest amount of moderate to dense forest canopy.

- Short of a hot wildfire in the aspen sites, Alternatives 4 and 5 will result in these aspen patches dying out. Restoration of aspen on as much as 60 acres by cutting out most of the pine and mixed conifer (Alternatives 1/2/3/6) will result in renewal of aspen sites and future habitat diversity.

- Road closures and obliterations proposed for Alternatives 1/2/3/6 provide the greatest amount of improvement for downstream water quality compared to Alternatives 4 and 5. The consequential reduction in access provides for less access for illegal firewood cutting and the least disturbance access to wildlife. The action alternatives also provide more immediate safety for Highway 87.

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# CHAPTER 1 - PURPOSE OF AND NEED FOR ACTION

This chapter describes the:

- underlying purpose and need in proposing alternative actions
- the analysis approach used
- resource objectives defined by desired conditions
- the final issues

## OVERVIEW

This Environmental Impact Statement (EIS) describes a Preferred Alternative and alternatives to the Preferred Alternative for management of the lands within the Pocket and Baker 10K analysis areas. This EIS incorporates the standards and guidelines of the Coconino National Forest Land and Resource Management Plan (1987) and its subsequent amendments which direct the overall management of the Coconino National Forest. The Pocket/Baker area includes the following management areas described in the Forest Plan.

TABLE 1: MANAGEMENT AREAS

| | Management Area | Percent of Pocket/Baker |
|---|---|---|
| MA 1 | Wilderness | 2% |
| MA 3 | Ponderosa Pine and Mixed Conifer (<40% slopes) | 57% |
| MA 4 | Ponderosa Pine and Mixed Conifer (>40% slopes) | 4% |
| MA 6 | Unproductive Timber Land | 10% |
| MA 7 | Pinyon-Juniper | 2% |
| MA 9 | Mountain Grassland | <1% |
| MA 10 | Grassland and Sparse Pinyon-Juniper | <1% |
| MA 19 | Mogollon Rim | 25% |

The Pocket/Baker area is located atop the Mogollon Rim at the south-central portion of the Coconino National Forest. The approximate 23,200 acre area is 60 miles south of Flagstaff, AZ, and 10 miles north of the communities of Pine and Strawberry (see Vicinity Map). State Highway 87 and 260 bisect the area from the southwest to northeast and north to south, respectively. Prominent geographical features include Baker Butte; Milk Ranch, Strawberry, and Nash Points; the Mogollon Rim; Five-Mile and 29-Mile Lakes and Fossil Creek Wilderness (Calf Pen and Sandrock Canyons).

## ECOSYSTEM APPROACH

An ecosystem approach to land management focuses on whole ecosystems rather than selected parts or processes. It focuses on sustaining desired ecosystem conditions of diversity, long-term productivity, and resilience, with yields of desired resources and uses commensurate with the larger goal of sustaining those conditions. An ecosystem perspective means considering the soils, waters, air, plants, people and animals, and all their relationships. Ecosystems have a constant flow of energy in and out and are constantly changing over time. Most of the time, ecosystems operate in dynamic equilibrium (Leopold and others 1964 and Odum 1971). The natural range of variability in an ecosystem includes the dynamic equilibrium range and disturbances such as wildfires and floods. People, an integral part of the ecosystem, are dependent on its resources and are cause for some of its changes.

The Pocket/Baker ecosystem is part of the larger ponderosa pine/bunchgrass and pinyon-juniper woodland ecosystems, which were analyzed on a larger scale in the Coconino National Forest Plan. A description of the soils, watershed, biota, ecological and human processes of the Pocket/Baker portion of those ecosystems are found in Chapters 3, 4, 5, 6, and 7.

While terms such as diversity and productivity are rather easily defined and without much controversy, the concepts of "sustainable" and "health" are not. Consequently, there is no consensus on the procedures to achieve "healthy sustainable ecosystems" (Wagner and Wilson 1993). The Pocket/Baker analysis closely follows Box's (1993) definition of sustainability. He describes sustainability based on extremes; from returning to a pristine past where man is ruled by nature to sole consumption, where man rules almost without regard to nature, but concludes that sustainability is neither an extreme nor an absolute. Rather, sustainability is based on cultural and social demands while protecting a land base that is basically ecologically stable. These social demands and standards and guidelines for maintaining an ecologically stable land base are defined in part in the Coconino National Forest Plan and its series of amendments since publication in 1987.

Definitions of forest health range from utilitarian to ecosystem perspectives. Utilitarian definitions state that forests are healthy if management objectives are satisfied, and unhealthy if they are not. The ecosystem perspective defines forest health as a balanced ecosystem. The latter definition demands that complex ecological processes are understood and quantitative data is available. Such is not the case. However, both utilitarian and ecosystem perspectives can be blended if both are applied to large landscapes with a mosaic of stand ages, structures, and levels of management that satisfy the range of demands placed on the landscape by society (Kolb, Wagner and Covington 1994). The latter is the forest health definition used in the Pocket/Baker analysis.

The range of variability described in the forest health definition manifests itself in landscape patterns. To understand the landscape patterns and the processes (physical, biological, and human) across the patterns, a landscape analysis approach (Diaz and Apostol 1992 and 1993) was used. This analysis method assesses the current landscape patterns (Chapter 3, Existing Landscape Conditions), and allows the inclusion of new ecosystem knowledge and management principles not considered in the Forest Plan. Included in this analysis is a look at natural disturbances and presettlement conditions to understand how things have changed and the consequences of those changes. The result of this analysis process yields a set of desired conditions, and identifies those existing conditions that are not moving toward the health and sustainability of the Pocket/Baker ecosystem. Thus, projects are identified that will rectify nonsustaining and unhealthy occurrences (Chapter 2, Management Alternatives), and the consequences of implementing those projects are disclosed (see Chapter 8, Environmental Consequences).

# FINAL
# ENVIRONMENTAL IMPACT STATEMENT

# POCKET-BAKER ECOSYSTEM

## COCONINO COUNTY, ARIZONA

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| Lead Agency: | USDA Forest Service |
| Responsible Official: | Fred Trevey, Forest Supervisor<br>Coconino National Forest<br>2323 E. Greenlaw Lane<br>Flagstaff, AZ 86004 |
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Six alternatives have been considered for the management of this area. These are (1) Resource Changes Focusing on Interim Directive #2 for the Mexican Spotted Owl; (2) Resource Changes Focusing on Aggressive Treatment of Dwarf Mistletoe; (3) Resource Changes Focusing on Uneven-aged Timber Management; (4) No Action Alternative and Curtailing Livestock Grazing; (5) Resource Changes Focusing on Continuing Livestock Grazing as a Current Activity; and (6) Resource Changes Focusing on Refinements from Comments to the Draft EIS. Alternative 6 is presented as the preferred alternative.

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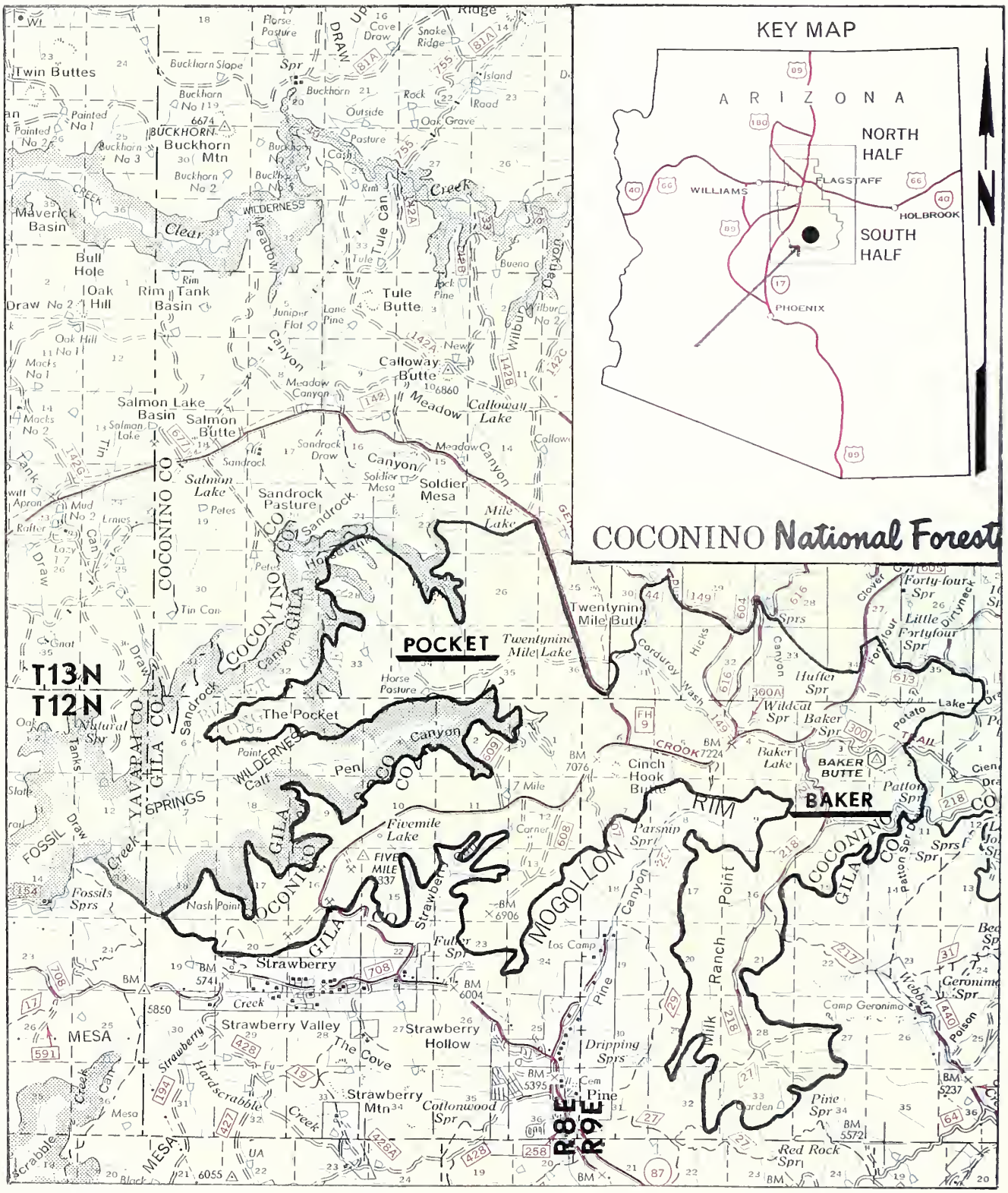


Functional linkages to areas outside the Pocket/Baker landscape include habitat for Mexican spotted owl, livestock movement between the Tonto and Coconino Forests, downstream water uses, and movement of people particularly from the Phoenix metropolitan and Verde Valley areas.

## HISTORICAL PERSPECTIVE

European settlers began to have an impact on the Pocket/Baker area at or near the turn of the century. Changes in use, management practices and accessibility over time have changed much of the original character of the area. Historical information is presented within various subsections of this report so the reader can understand why conditions are as we find them today, and perhaps why the actions proposed in Chapter 2 are appropriate to move toward a more sustainable condition for all components of the ecosystem.

## FINAL ISSUES

Issues drive the planning process. If no significant issues {40 CFR 1508.27} had been identified, current management would have been confirmed with only minor changes. The fact that significant issues were identified meant that conflicts in resource uses and management would have to be addressed. The purpose of the Preferred Alternative is to change current management direction as necessary to address the identified issues.

### 1. ABSENCE OF FIRE IN THE ECOSYSTEM

Less than 10% of the Pocket/Baker area has been broadcast burned within the last 15 years. Covington (1993) attributed the following problems in the pine/bunchgrass ecosystem to the exclusion of fire: increase in tree density, decrease in herbaceous and shrub production; decrease in food web diversity; disruption of organic matter processing and nutrient cycling; increased fuel loading; increased fuel ladder; decreased tree vigor; and ecosystem simplification. Reintroduction of cyclic burning is made more difficult by heavy fuel loading and air quality standards that limit the amount of days that burning can occur. Potentially catastrophic wildfires like the Bray and Dude fires of 1990 could occur along the Mogollon Rim above and around the communities of Pine and Strawberry.

**DESIRED CONDITION:** Fires are occurring at cyclic, historic intervals without significant catastrophic effects, so there are minimal threats to the communities of Pine and Strawberry. Nutrient cycling is occurring because frequent, low intensity fires break down sufficient available coarse woody debris. As a result, forbs and grasses are abundant, diverse, and vigorous.

**RESOURCE OBJECTIVES:** Reintroduce fire into the ecosystem. Maintain coarse woody debris at 5-10 tons per acre so that there are defensible wildfire control positions above the Mogollon Rim, Calf Pen, Sandrock and Horesetank Canyons. A defensible position is one in which favorable conditions exist to safely and efficiently contain the spread or unacceptable damage of a wildfire.

## 2. LACK OF VEGETATIVE SERAL STAGES AND DIVERSITY

In the overstory vegetation, the dominant size/age class for the ponderosa pine sites is a young forest (diameters from 9-18 inches in diameter) (approximately 80% of the area). Past management prescribed the removal of larger pines without the proper treatment in the younger trees, resulting in removal of the old trees and simplifying the vertical structure to dominantly young to middle-aged sized trees. Snag removal practices up until the early 1980's combined with the timber harvest of large trees has resulted in a shortage of existing and recruitment trees for snags.

In the understory vegetation, a lack of cyclic burning, seeding practices after timber sales, and historic to more recent grazing practices have contributed to an inadequate layer of herbaceous and grass vegetation and a reduced diversity of species. The lack of ground cover is contributing to erosion in some soil units.

**DESIRED CONDITION:** There is a diversity of seral stages and stand structures within all vegetative species.

**RESOURCE OBJECTIVES:** Balance the distribution of age classes. Increase vegetative cover on sandstone soils. Increase grass cover in the pinyon-juniper sites. Increase the middle to high succession graminoids. Accelerate the growth of smaller trees to attain trees larger than 18 inches DBH. Restore natural fire cycles and behavior to the ecosystem.

## 3. DEVELOPING AND SUSTAINING OLD GROWTH TREE STRUCTURE

The previous issue identified the lack of vegetative structures, particularly the uneven-aged structure and older clumps of trees needed to provide for nest/roost habitat for the Mexican spotted owl. The old growth tree structure is preferred not only by the Mexican spotted owl, but also by the majority of Coconino National Forest wildlife species (USDA 1996a).

Many of the ponderosa pine sites are heavily infected with southwestern dwarf mistletoe, a parasitic disease common throughout the forest. There are limitations to stand development strategies when dealing with heavier levels of dwarf mistletoe infection. Stands with moderate to high levels of dwarf mistletoe will not develop into quality unevenage conditions. Application of the results from a 32-year study by Hawksworth and Geils (1990) of dwarf mistletoe-caused tree mortality indicates, that if left untreated, high levels of dwarf mistletoe will impact canopy closure levels in about 30-60 years in the future. Those results combined with the numerous other studies regarding the physical effects to tree growth, indicates that young stands (VSS2, VSS3) or young trees (about 80 years old) with current high infection levels will likely succumb to mortality within 50 years. Therefore, the greater the proportion of young trees in a given stand, the more difficult it will be to develop dense canopy in the long term, or the number of large stems to adequately stock a site with old growth trees.

Existing stands with older trees that are moderately or heavily infected are not as susceptible to mortality. However, when retained over pine regeneration, such old growth trees will infect the regeneration underneath. Because trees less than 9 inches DBH are very susceptible to mortality from high levels of dwarf mistletoe, stand development into dense canopied stands or old growth is tenuous at best. Removing such old growth trees reduces the vertical structure that already is very limited. Retaining such infected trees yields young stands which will likely not develop into desired future old growth and unevenage stand conditions.

With 47% of the Pocket/Baker area in moderate to high dwarf mistletoe rating, the crux of this issue is how much and what kind of treatment is needed now while maintaining current wildlife habitat needs and providing for sufficient habitat in the long term. With nearly 75% of the study area being in critical habitat for the Mexican spotted owl, potential impacts seem greatest to this wildlife species.

In the short term, there are negligible impacts to canopy closure, because only 9% of the current suitable nest/roost habitat is infected with high levels of dwarf mistletoe. However, stands with high infections of dwarf mistletoe cannot sustain the canopy closures needed to continue meeting the nesting/roosting requirements for the owl. These high level infection stands are projected to lose their suitable nest/roost status in 30-60 years. And while approximately 35% of the suitable nest/roost habitat is infected with moderate levels of dwarf mistletoe, these stands will also move toward high infection levels and follow the same pattern of canopy decline, but several decades later.

With the small amount (5.4%) of existing suitable habitat, the importance of creating additional suitable habitat is great. And with nearly 50% of the ecosystem currently at moderate or high level infections, the ability of the area to provide future nest/roost habitat is limited, particularly since only about 1/3 of the analysis area has the potential of ever reaching nest/roost habitat. Developing nest/roost habitat may never attain suitable status, because dwarf mistletoe infections will decline canopy closures long before the desired canopy density is achieved.

Harvesting trees now to reduce dwarf mistletoe for future, cleaner stands will modify the canopy closure and may result in an adverse impact to the Mexican spotted owl. The consequence of no treatment may also result in adverse affects, because after 30-60 years the reduction of canopy closure will also occur, either declining the future suitable nest/roost habitat or preventing new nest/roost habitat from being reached. In addition, delaying treatments now will increase future costs and reduce options for maintaining the desired vegetative structures.

**DESIRED CONDITION:** Dwarf mistletoe infection levels are low enough to allow the attainment and sustainability of old growth and unevenage habitat sufficient for old growth dependent wildlife species. Management direction is leading to conditions toward the delisting criteria of the MSO Recovery Plan. These criteria are summarized as follows: population must be stable or increasing after 10 years of monitoring; scientifically-valid habitat monitoring protocols are designed and implemented to assess gross changes in habitat quantity and habitat modifications; habitat trends must be stable or increasing; and a long term management plan is in place.

**RESOURCE OBJECTIVES:** Reduce the level of dwarf mistletoe infection so that (1) growth and mortality loss is limited and dense canopy conditions increase in the long term; and (2) prescriptions can be implemented to create unevenage structures and structures resulting in old growth conditions.

## 4. DECLINE OF ASPEN IN THE ECOSYSTEM

The 18 occurrences of aspen (most less than an acre in size) are declining for several reasons. Lack of fire is retarding aspen sprouting and increasing the effects of competition from grasses and other tree species. Large elk populations seek out the young aspen shoots limiting reproduction success. The harsh treatments to stimulate aspen reproduction are expensive (elk proof fencing) and visually displeasing (virtual clearcuts), especially along well travelled corridors.

**DESIRED CONDITION:** The long-term presence of aspen is guaranteed by periodic regeneration of individual stands.

**RESOURCE OBJECTIVES:** Restore aspen sites by stimulating regeneration and reducing competition from other species (flora and fauna). Implement more historic fire cycles.

## 5. INCREASING DEMAND FOR RECREATIONAL ACTIVITIES

The expressed need for an increased variety and amount of yearlong recreational activities is increasing faster than the ecosystem can handle. This demand manifests itself in unsafe or resource damaging activities such as snowplay at Cinch Hook gravel pit, off-highway vehicle use on road 608, and camping in compaction-sensitive meadows.

**DESIRED CONDITION:** There is no compaction in meadows resulting from recreational uses. The 608 road is open to OHV users because the erosion has been stabilized and historical structures restored through a partnership. Cinch Hook snowplay area is open each winter for safe, snowplay activities.

**RESOURCE OBJECTIVES:** Reduce compaction in meadow sites by fencing, ripping, rerouting roads. Form partnerships with user groups for safe use of the 608 road and Cinch Hook snowplay area.

## 6. WATERSHED AND SAFETY PROBLEMS WITH TRANSPORTATION SYSTEM

Many forest roads lay within the confines of stream courses or their filter strips inhibiting the watershed from properly transporting water. Some roads are not within stream courses, but have improper drainage structures causing erosion and sedimentation. In addition, the road density is well above Forest Plan guidelines.

State highway 87 has 6.7 miles of hazardous conditions, ranging from hazardous trees that can fall into the roadway to areas of dense, young trees that shade roads creating long-lasting ice patches. Opening up roadside stands draws grazing wildlife to the area enhancing the problem of animal/vehicle collisions.

**DESIRED CONDITION:** Stream courses are functioning properly in the transport of water. The ecosystem is in compliance with the Federal Water Pollution Control Act. Highway 87 has safe sight distances and adequate clearing for recovery zones. Trees are not causing significant icing problems by shading the roadways. Preferred grass and browse species are found away from the roadside edges so ungulates are not drawn toward the highway.

**RESOURCE OBJECTIVES:** Restore drainage to normal channels. Reduce tree density along highway 87 to create safe sight distances, recovery zones, and rapidly melting ice conditions.

# CHAPTER 2 - MANAGEMENT ALTERNATIVES

This chapter describes the:

- process used to develop and evaluate the alternatives
- alternatives considered but not given detailed study
- alternatives considered in detail
- comparison of the features of all alternatives

## ALTERNATIVE DEVELOPMENT

An interdisciplinary team evaluated that part of the pine/bunchgrass and pinyon pine ecosystems that lies in the Pocket and Baker 10Ks. The project analysis has evolved over a four year period, initially beginning as a timber sale environmental assessment. In 1993, the Long Valley District decided to broaden the planning area to combine analysis of the Pocket and Baker areas for several reasons. First, the areas were adjacent to one another with many similar conditions, needs, and uses. Second, the combination of the two areas allowed for the analysis of the understory vegetation (grasses and forbs) not as a single analysis but in context within other proposed activities. Finally, it was a short step from that integration to looking at the entire 20K from an ecosystem perspective.

While analysis procedures prior to the ecosystem approach had identified many of the resource needs of the 20K, the team set those items aside and began with a fresh look from the ground up, specifically researching and addressing the functions of each of the components of the ecosystems in the following hierarchy: soils, water, vegetation, wildlife, natural disturbances, and the human uses.

The introduction to this analysis titled "Ecosystem Approach" describes in general the principles and tools involved in this analysis. Central to the team's approach in determining projects needed for the health of the ecosystem were several guiding principles that relate to the human dimension in ecosystems.

1. Humans are an integral part of the Pocket/Baker ecosystem with demands for goods and services. Not all of the human demands can be accommodated. Therefore, alternatives were designed that best maintain the resilience of the ecosystem while providing a variety of goods and services.

2. Past, present, and future human perceptions, beliefs, needs, and wants influence ecosystems. Desired conditions may reflect some of these perceptions and conflict with others. While debates over the value of returning to some or all presettlement conditions or the habitat needs for recovery of threatened and endangered species continues, the Team found that the basic, most urgent needs for the ecosystem are building blocks for any future management strategy.

## MANAGEMENT ALTERNATIVES CONSIDERED, BUT NOT FULLY DEVELOPED

A unified request by Southwest environmental groups to consider restoration of the fire regime without livestock grazing was made to the Regional Forester on May 19, 1995. The letter concludes that the potential for natural restoration via a decrease in tree density is possible with removal of livestock. The Pocket/Baker area is overstocked with young trees around 80 years of age. This abundance of young trees was, not coincidentally, begun as a result of a phenomenal seed crop and germination in 1919 during an extensive overgrazing period. Field inventories indicate seedlings and saplings currently make up 4% of the Pocket/Baker area, while trees in the young to middle-aged forest structure represent nearly 90%. Therefore, the overstocking has generally already occurred. Removal of livestock at this point will have little effect on the reduction of overstocked small trees.

Considering that 47% of the Pocket/Baker pine and mixed conifer sites have open canopies where additional reproduction might likely be expected to occur, to have only 4% of the study area in seedling/sapling conditions (and not necessarily overstocked) with livestock grazing for the past 100 years hardly seems problematic. *Therefore, an alternative that presented restoration of fire in absence of livestock grazing was not considered further.*

## MANAGEMENT ALTERNATIVES CONSIDERED IN DETAIL

Alternatives were designed generally in response to the changing management strategies for the MSO. Over the analysis period, the Interdisciplinary Team designed three options for managing the range resource (Alternatives 1/2/3/6, 4 and 5); four options for managing the timber resource and miscellaneous proposals for roads and recreation (1, 2, 3, 6); and two proposals that were variations of the No Action requirement (4 and 5).

This section presents the six alternatives developed for the Pocket/Baker ecosystem area to address the area's resource needs and the issues raised from the Proposed Action and the Draft EIS. The evolving management for the Mexican spotted owl changed significantly six times during the analysis of this ecosystem (Interim Directive #1, Interim Directive #2, dispersal habitat from biological opinions, listing and critical habitat, Draft MSO Recovery Plan, Final MSO Recovery Plan). How well each alternative ultimately compared to the final of these management directions (Final Recovery Plan) is disclosed in the effects section of this document.

The following alternatives are proposed to meet the ecosystem needs identified in the project objectives and address the issues raised during project scoping.

**Alternative 1** proposes the following resource needs based on a landscape ecosystem analysis of the area. Alternative 1 was designed utilizing the management direction in Interim Directive #2. Biological opinions on other projects regarded dispersal habitat as an important item, and the opinions heavily reflected protecting such habitat. Though not adopted by the Forest Service in Interim Directive #2, the dispersal habitat guidelines became a key factor in determination of adverse impact. Several timber sales under contract were halted and eventually partially cancelled (incurring damage claims exceeding 1/2 million dollars on the Coconino National Forest).

This alternative includes the management of unevenage and old growth vegetative structure; prescribed fire on approximately 17,000 acres; restoration of 50 acres of scattered aspen sites; reduction of hazards along State Highway 87; implementation of improved range management; treatment of dwarf mistletoe infected sites by timber harvest on approximately 5,650 acres; and partnerships to restore Forest Service road 608 and reopen Cinch Hook snowplay area for safe winter recreation. Alternative 1 is the action that was proposed by the interdisciplinary team from initial public comment in the early stages of the Pocket/Baker analysis. This alternative was sent to the public for comments as the Proposed Action (February 1, 1994).

**Alternative 2** is the same premise as Alternative 1 except the treatment of dwarf mistletoe is on a much more aggressive scale, utilizing shelterwood seedcutting to a greater extent. All the same projects as Alternative 1 occur except timber harvest occurs on about 6,800 acres. Realizing that dispersal habitat guidelines tended toward single-species management, the Team developed Alternative 2 to provide and maintaining desired vegetative stand structures in a broader ecosystem approach.

**Alternative 3** is the same premise as Alternative 1, but scales back the amount of seed cut harvests and emphasizes uneven-aged prescriptions. The same projects are proposed as Alternative 1 except timber harvest occurs on about 4,200 acres. When the MSO became listed as a threatened species, the Fish and Wildlife Service provided the Forest Service with draft guidelines for management within proposed critical habitat. Realizing that neither existing Alternative 1 or 2 met these guidelines, Alternative 3 was designed to implement recommendations of the Draft MSO Recovery Plan and thus not adversely affect proposed MSO critical habitat. The Draft MSO Recovery Plan limited the acreage that could be harvested within any given decade.

**Alternative 4** is the No Action Alternative as required by the National Environmental Policy Act regulations. Selection of this alternative would mean that current management of all resources will continue except that livestock grazing will cease when the permit expires in 1999. This alternative serves as a baseline for comparison of all alternatives.

**Alternative 5** is the same as the No Action Alternative *except* that livestock grazing will continue as a management activity under the current rest-rotation grazing scheme.

**Alternative 6** is a further refinement of the preferred alternative presented in the Draft EIS for Pocket/Baker. It presents the same projects as Alternative 1 except timber harvest occurs on about 5200 acres. **This is the preferred alternative**. The Recovery Plan for the Mexican Spotted Owl (Final) was signed October 16, 1995. There were both clarifications and differences between the Draft Recovery Plan and the Final. Therefore, not all of the assumptions on which Alternative 3 was based remained valid. Alternative 6 was created as a modification to the Preferred Alternative (#2 in the Pocket/Baker DEIS) to meet all of the criteria established by the Mexican Spotted Owl Recovery Plan and in compliance with the Regional Spotted Owl and Northern Goshawk EIS for the Amendments to the Forest Plans.

Summaries in graph, table, and map formats can be found at the end of this chapter and in the Appendix.

## FEATURES COMMON TO ALTERNATIVES 1, 2, 3, 6

### Soils/Watershed Management

**Resource Objectives:** Reduce compaction, erosion, and sedimentation; restore nutrient cycling function to greater level by:

- Obliterating roads at Garden Springs and 29 Mile Lake.
- Moving the corral at 5 Mile Lake that became inaccessible when the road through 5 Mile Lake was obliterated.
- Treating the juniper invasion in TES unit 494 on approximately 200 acres. Cut alligator juniper greater than 10 feet tall (but not old growth--greater than 12 inches diameter root collar). Stack some of the slash over the stump, and lop and scatter the rest. For junipers less than 10 feet tall, stack slash over the stump. Burn the piled slash 1-2 months later to kill the stump to prevent sprouting. Seed burn sites if the piles burn hotter than prescribed. At 5-10 years after initial treatment, broadcast burn the grassland to kill sprouting and regenerating juniper. Where the treatment site is within 1/2 mile of the Peregrine falcon nest site, cut prior to breeding season (March 1 - July 30). Burn during breeding season. Ripping landings at the slope break in Corduroy Wash (6039, 9387F); obliterate roads 149A, 149B, 149D, and 9388X. Spread out existing piles along road 149B (by hand). Obliterating 46 roads (38.7 miles) that are within stream courses or within stream course filterstrips.

### Aspen Management

**Resource Objectives:** Encourage regeneration, sustainability, and expansion of aspen sites in decadent or remnant stands by:

- Removing pine and fir in aspen sites on approximately 6 sites up to 10 acres each. The site size will be determined by evidence of sprouting. Leave tree tops of harvested trees to provide sufficient slash to achieve high fire intensity and moderate fire char in subsequent prescribed burn (part of the broadcast burns proposed for the area at large) where necessary to stimulate site. Retain larger pine and fir for added diversity.
- Fencing the aspen site to protect regeneration from livestock and elk grazing with a elk-proof fence immediately after burning, or after logging if no damage will occur to the fence.

### Prescribed Fire and Wildland Fire Management

**Resource Objectives:** Reintroduce fire as an integral part of the ecosystem to maintain a mosaic of vegetation, including grasses, forbs, browse, and trees; cycle nutrients; and reduce the severity of future wildfires while gaining support from urban interface areas for prescribed fire (see Appendix D).

**Pinyon-Juniper Woodland**--Prescribe burn 10-50 acre patches of small alligator juniper trees on 100-200 acres at Nash Point and associated points east to remove trees that are encroaching into the grassland communities and out-competing ground cover species.

**Fossil Creek Wilderness**--When a Wilderness Fire Plan is written and available for use, burn the old, decadent browse plants on Pocket Point to stimulate growth and health of the community. When a Plan is available, prescribed burning is allowed in the Fossil Creek Wilderness area.

**Hazard Reduction**--For existing piles of slash, hazard reduction along the edge of the Mogollon Rim (the escarpment and generally up to 1/2 mile away) consists of burning some piles while crushing other piles. Crushing is defined more as unpiling and scattering rather than pulverizing the slash into pieces. For existing piles away from the rim edge burning will occur more than crushing, but crushing is still an option to burning especially where there is a deficit in down woody material. Total crushing and pile burning is approximately 2400 acres.

**Broadcast Burning**--Broadcast burn on sites where forest fuel litter exceeds 15 tons per acre (approximately 4300 acres) for the reduction of forest fuels and reintroduction of fire into the ecosystem. Since forest fuel patches are not homogeneous, other sites with lesser tonnage are included to create burn units with logical breaks for holding purposes. Standards to be included in the burning prescription are:

- Retain 5-10 tons per acre of woody debris.
- Retain snags and dead and down logs at rates specified in the Forest Plan. Techniques to accomplish this include constructing handline, application of foam, application of water, or avoidance.
- Minimize soil temperatures. Use low fire intensities. Use stage burns over a period of several months or years to burn layers in a cool a burn as possible (very short burn window) to alleviate raising soil temperatures in heavy slash.
- The choice of harvesting first or burning first in all stands where both activities occur will be guided by the ability to meet the burning prescriptions.
- Focus on south-facing slopes under cooler/wetter conditions; focus on north-facing slopes under drier/warmer conditions.
- Burning may occur at any time of the year, and time of day, with ADEQ approval and concurrence form the Fish and Wildlife Service. The public will be notified through news releases. Safety signs will be posted as needed.
- Broadcast seed with an appropriate mix of grasses and forbs as needed to increase ground cover vegetation and protect soils and watershed resources. Soils may need to scarified if capped or damaged during burning.
- The burning prescription includes: day temperatures between 45-65 degrees Fahrenheit; relative humidities between 20-70 percent; 1 hour fuels at 6-10; wind speed at 5-10 miles per hour; use of backing fire; flame lengths generally at 6 feet; and allowable scorch height generally at 2-8 feet.

**Treatment of Activity Slash**--Broadcast burning is to occur where existing plus projected slash after treatment exceeds 15 tons/acre. All standards included in broadcast burning (above) apply. Machine piling is not expected to occur except on landings.

- Slash from precommercial thinning along highway 87 is either removed, hand piled and crushed and/or burned or chipped and spread on site.
- Slash from roadside hazard strips along highway 87 (partial areas within location/sites) will be (in order of preference) lopped and scattered (with and without broadcast burning), hand piling, machine piling, depending on the method of harvest (traditional vs. whole tree), density of residual stand, topography for landing/disposal locations, and density of existing slash.

**Forage/Watershed Improvement Burns**--Forage and/or watershed improvement is designed to enhance species diversity, vegetation ground cover, forage, and soil productivity (because of the ground cover increase) by broadcast burning on approximately 10,000 acres. Defer burning until after harvest if the site is scheduled for a timber harvest.

- Sites burned are scheduled for maintenance to control needlecast layers. Burn area will be grazed the same year(s) of the burn and then rested the following year to allow establishment of plant species without livestock impact. Maintenance burns will occur about every 6-10 years in B canopies and 10-15 years in A canopies to maximize grass/forb component over needlecast. Monitor soil/vegetation using Daubermire transects to determine when maintenance burn is needed. On regeneration prescription sites, burn for natural site prep, and then schedule no other burns until regeneration is well established.

- The burning prescription will include the same recommendations as those listed for broadcast burning.

**Wildfire Management**--Reintroduction of fire will be initially accomplished primarily through prescribed burns already mentioned. At some point in the future, fuel loading will be at a level to where natural ignitions will play an increased role.

- Increase public education efforts when fires are occurring in the Pocket/Baker area. Appropriate suppression response for wildfires (contain, confine, control) will be used and is based on the most cost effective and safe way to manage fire.

## Travel Management

**Resource Objectives:** Improve water quality. Improve the safety along State Highways 87 and 260 by reducing highway shading and tree hazards, and providing improved access to Forest Roads by:

- Reducing tree density by 25% to 75% within the noncontinuous 6.7 mile zones identified by ADOT along highway 87 as safety hazard areas. To maintain visual integrity, tree removal will be blended into existing stand conditions up to 300 feet (but generally within 100 feet) from the road shoulder. Additional areas will be treated as part of harvest units described under each alternative. Stumps will be flush cut or removed.
- Clearing trees from within 33 feet of the highway edge (white edge stripe) (the distance altered by topography) to provide runout zones and placement for plowed snow.
- Seeding open areas adjacent to the highway with low palatability grass and forb species that will protect soils, but not attract wildlife to the highway's edge.
- Emphasizing moderate and high mistletoe conditions for tree removal within the highway zones while featuring large oaks, alligator junipers, and yellow pines.
- Removing hazard trees along the entire 87/260 highway corridor; these are trees, live or dead, that could fall onto or block the highway. The following constitutes a hazard tree: snags that can fall onto the highway; live trees that have a 15%+ lean toward the highway, exposed and weakened root structure, rot near the tree base, large forks leaning over or towards the highway, fading or dead tops, or trees projected to die within 10 years; or trees severely damaged when felling hazard trees.
- Closing, obliterating, and/or relocating roads throughout Pocket/Baker where existing roads are not needed for resource and management of the area (see Appendix E for specific listing of roads).

## Grazing Management

**Resource Objectives:** Reduce overgrazing and overrest. Increase ground cover and vigor of grass/forb layer by:

- Combining the Baker Lake (BL) and Calf Pen (CP) grazing allotments under one permit.
- Incorporating 29-mile and/or Highway Junction pasture of the Pivot Rock grazing allotment northwest of Highway 87 into the Baker Lake/Calf Pen allotment using an agreement with the Pivot Rock permittee.
- Installing the following range structural improvements to change the current pasture configuration from 5 pastures to 10 pastures (including the Pivot Rock pasture) and improve livestock use distribution; tanks will be available for wildlife use year-round. Resulting pasture size is approximately 1,000 - 2,000 acres.

TABLE 2: RANGE IMPROVEMENT ITEMS

| Item | Quantity | When |
|---|---|---|
| 2-3 stranded elect. fence* | 2 1/4 miles | Yr 1 |
| Barbed-wire fence | 3 miles | Yr 1 |
| Rebuild tanks | 5 each | Yr 1 |
| Build tanks | 5 each | Yr 1 |
| w/in pasture cattleguards | 6 each | Yr 1 |
| highway cattleguards | 6-10 each** | Yr 1 |

*Proposed fenceline locations are approximate; adjustments are likely during on-the-ground implementation based on TES, recreation, unique vegetation, wildlife, and cultural resource concerns.

** Install cattleguard where new fencing crosses main forest roads and at main access points from Highways 87 and 260. Six (6) cattleguards will be installed initially; if problems still occur along the highway additional cattleguards will be installed at problem access points.

- Grazing livestock to maintain and improve ground cover vegetation by:
  - aggregating the BL/CP permitted livestock with cows under permit to the Randalls on the Tonto NF, and allowing all the livestock to use the BL/CP allotment from approximately the middle of June to October 31 each year. Livestock numbers on the BL/CP allotment will range from 100 to 300 and decrease/increase according to monitoring results. The time that livestock use the area will be reduced from 153 days to 123 or fewer days (time controlled grazing implemented);
  - by grazing 1/2 (5 pastures) and rest 1/2 (5 pastures) of the combined allotment each year; Highway 87 is the division line. Reverse the grazed/rested pastures each year; reducing the graze periods to 15-30 days per pasture given a potential 123 day use period. The actual length of graze period in each pasture will depend on plant phenology or growing stage. During fast growth the length of graze will be 20 days or less; during slow grow or plant dormancy the

length of graze will 30 days or less. Close monitoring of plant growth conditions prior to and throughout the graze period will be required.

- by not allowing regrazing of pastures is allowed in any given year. If time or forage is no longer available for livestock use, the animals will be moved back to the allotment area on the Tonto NF.
- by not grazing the Baker pasture of the Baker Lake allotment to allow the elk a place to go whilelivestock are grazing the Baker Lake pasture in the year that Baker Lake pasture is grazed.

### Southwestern Dwarf Mistletoe

**Resource Objectives:** Treat the dwarf mistletoe according to resource objectives specified for a particular stand. Where the objective is to lessen the negative effect on the growth rates of ponderosa pine and to assure the long-term sustainability of desired canopy densities, the following guidelines apply:

- The priority of sites selected for treatment with a timber harvest is: infection rating low, high, moderate.
- Within limits set by other resource concerns, in **low** and **moderate** infection ratings, utilize thins from below. Sanitation prescriptions target infected trees only, while intermediate prescriptions target infected trees and additional trees to reduce stocking.
- Within limits set by other resource concerns, in **high** infection ratings, utilize group shelterwood seed cuts to cut out patches of severe DM infections.
- Within limits set by other resource concerns, within sites where seedlings/saplings have been established and there is a significant risk of infection from the overstory, infected trees will be removed utilizing an overstory removal prescription.

### Recreation Management

**Resource Objectives:** Stop the erosion to the 608 road and damage to the historic drainage structures; provide safe winter snowplay and parking by:

- providing information on a landscape basis that will be tiered to for decisions regarding the management of Cinch Hook snowplay area, cross country skiing, and the use of the 608 road.

## FEATURES COMMON TO ALTERNATIVE 1 ONLY
## (Proposed Action-2/1/94)

Apply an ecosystem approach to managing the area that considers the biological needs of the area, including water, soils, overstory and understory vegetation, and wildlife habitat needs; and human desires for recreation, visual quality, safe access, use, and commodities. Treat dwarf mistletoe for the long term objective of sustainable MSO habitats (especially the dense, multi-layer structure required for nest/roost habitat), for enhancing ponderosa pine tree growth and for vegetative seral stage diversity (particularly increasing the large tree component) (see Appendix D for a map).

- Implement the following items listed in "Features Common to Alternatives 1, 2 3, and 6": Soils/Watershed Management, Aspen Management, Prescribed Fire and Wildland Fire Management Travel Management, Grazing Management, Southwestern Dwarf Mistletoe Management, Recreation Management.

- Manage the ponderosa pine by implementing treatments that change vegetation stand structures to a distribution toward conditions described in the goshawk guidelines as a means to apply a diversity of seral stages across the landscape. The presumption is that such a breakdown of VSS classes will provide a range of wildlife habitats across the landscape. This presumption was confirmed in the analysis of the West Clear Creek ecosystem (USDA 1996b). Inherent in these proposed alternatives is the need to temper implementation based on current distribution of VSS classes and mandated direction, particularly the recovery of the Mexican spotted owl (MSO).

- The Forest Plan states that standards and guidelines shall be applied on a 10K basis. Though both the Pocket and Baker 10K's are considered in this analysis as one ecosystem, selection of harvest sites was still based on the ability of each 10K to meet the Coconino Forest Plan standards and guidelines.

- The following components were removed from consideration for timber harvest because of Forest Plan standards. Components at or moving naturally toward desired conditions were also removed from harvest consideration. In most cases, these components of the ecosystem are eliminated from potential timber harvest because they are currently supplying a niche in very limited supply (as identified during the landscape design process). Please note the difference between site (stand) and clump (see Appendix for definitions).

  **Wilderness**: No timber harvest as per the Forest Plan.

  **Slopes Over 40% (MA4)**: Deferred from harvest during this planning period as per the Forest Plan.

  **Suitable Nest/Roost MSO Habitat**: This component is in limited supply; reducing this component will constitute an adverse action. The consequence of reducing suitable nest/roost habitat in the Pocket/Baker ecosystem area is greater than leaving the suitable habitat and reducing site treatment options in the future (there is a minor amount of suitable habitat affected by aspen and broadcast burning treatments.

  **"C" Canopy**: This component is in excess within VSS 4, but severely lacking in VSS 5 and 6. The result is an overall shortage and a deferral of this component except selected sites in VSS 3 outside MSO territories or selected clumps within VSS 4, 5, and 6 sites with intense mistletoe infections.

**VSS 5/6, Developing Old-Growth, and/or Existing Old-Growth**: Sites with older ponderosa pine (yellow pine or close to yellow status) on 50% or more of the site are deferred as per the Forest Plan. Though some treatments are warranted to reduce tree density and dwarf mistletoe infection in these sites, the team felt these sites should be deferred at this time because of the limited supply of this component in the project area.

**Wilderness Boundary**: There are some sites adjacent to the unsurveyed wilderness boundary. To avoid trespassing into the wilderness, some sites were deferred from timber harvest at this time.

**Sensitive Soils**: Where there is only a marginal chance of regenerating trees because of low productivity soils, harvest treatments will not occur.

**Isolated Pine Sites**: Not harvested because of access difficulties and/or the sites are pine stringers with wildlife emphasis.

**Mistletoe-Free Sites**: Sites without mistletoe are a minority. The mistletoe free sites will serve as anchor points to radiate out from with treatments on adjacent mistletoe stands. No timber harvest in mistletoe-free sites.

**Moderate and High Mistletoe Infection in "B" and "C" Canopies**: To meet requirements for the Mexican spotted owl, none of the B or C canopy can be reduced below 40% (the minimum for B canopy) as the 10K total is currently at the minimum level of dispersal habitat. Sites with high mistletoe in 40%+ canopies (90+ basal area) require treatments that will reduce the canopies below 40%. Therefore, high infected sites with basal areas of 90+ will be deferred from timber harvest (except for 125 acres of borderline 40% canopy) (BAKER SIDE ONLY).

**Moderate Mistletoe Infection in "A" Canopies**: The necessary treatment on sites with moderate mistletoe ratings in A canopies are seedcuts. This action would greatly increase the number of acres of VSS 1 well beyond the desired level. Therefore, stands with moderate mistletoe in A canopies are being deferred (except for a few stands that have an infected overstory with a seedling/sapling understory).

**Mixed Conifer**: The Forest Plan deferred treatments in the mixed conifer component.

- The following prescriptions apply for stands treated with a timber harvest:

**Sanitation: (1906 acres)** Remove mistletoe infected trees with tree ratings 3-6 in trees 9+ inches DBH and all trees with mistletoe if opening is no larger than 1/4 acre including yellow pines if they represent the lone immediate infection source. Remove all trees less than 9 inches infected with mistletoe. Utilize variable density, uneven spacing; an average of 80 basal area, varied from 60 basal area in areas already near the minimum and where high levels of dwarf mistletoe exist to 100 basal area where stocking is high and dwarf mistletoe does not exist. Maintain 40%+ canopy in stands now designated with B or C canopy. (To meet B or better canopy, the crown condition must have a canopy closure of 40%+ on 50% or more of the stand not

averaging in the openings, natural or otherwise.) Use check plots during the marking phase to determine that the 40%+ canopy has been met. Yellow pines will be removed only if they have a seedling/sapling understory that is being or will be infected by mistletoe and the yellow pine are the only remaining infection source.

**Intermediate: (2492 acres)** Sanitation (described in above paragraph) plus reduce stocking. C clumps within VSS 5 or 6 may be reduced to A or B clumps only when required to remove highly infected mistletoe trees (not stocking). Maintain 40%+ canopy in stands identified as wildlife corridor. Yellow pine management same as sanitation. Treatments in moderate mistletoe infections will approach the visual effect of group shelterwoods where moderate infections are continuous and at the high end of the moderate infection scale.

**Group Shelterwood Seedcut: (896 Acres)** Seedcuts will be group shelterwoods with the objective of removing clumps of trees that are infected with dwarf mistletoe and retaining the healthiest groups of trees, where they exist. Where DM is extremely heavy over large areas, smaller clumps and possibly single seed trees will be left. The latter more accurately reflects a standard seedcut to 30 basal area. Treatment of yellow pines same as sanitation. The resulting vegetation condition will generally be left in an A canopy. Seedlings and saplings smaller than 5 inches DBH infected with DM will be slashed. Fill-in planting will occur if the site does not regenerate. Such plantations will be fenced to exclude livestock.

**Overstory Removal: (269 acres)** Treat all dwarf mistletoe infected overstory where seedlings and saplings have been established. Slash infected understory. Trees over 18 inches that are potential snag recruitment trees will be baited with western pine beetle pheromone to induce mortality.

**Precommercial Thinning: (93 acres)** Sites 681-28 and 686-26 will be thinned in trees less than 5 inches DBH to appropriate stocking levels.

**General Guidelines:** B+ canopies may be reduced to A canopies in sanitation and intermediate prescriptions except for wildlife reasons as stated above for the Pocket side. For the Baker side, B+ canopies may NOT be reduced to A canopies in sanitation and intermediate prescriptions in SITES designated with VSS B or C. Maintaining B+ canopies in CLUMPS within sites designated VSS A is not mandatory.

The overall theme for those prescriptions is implementing a variable density, uneven spacing, clump management to retain basal areas generally from 60-100 in treated clumps, the residual basal area being determined by current conditions and the needs for treatment. Remove competing and overtopping pines around large, healthy oak trees and old growth alligator junipers. Trees over 24 inches DBH designated for removal will be baited with western pine beetle pheromone for the creation of snags.

## FEATURES COMMON TO ALTERNATIVE 2 ONLY

Apply an ecosystem approach to managing the area that considers the biological needs of the area, including water, soils, overstory and understory vegetation, and wildlife habitat needs; and human desires for recreation, visual quality, safe access, use, and commodities. Aggressively treat dwarf mistletoe for the long term objective of sustainable MSO habitats (especially the dense, multi-layer structure required for nest/roost habitat), for enhancing ponderosa pine tree growth and for vegetative seral stage diversity (particularly increasing the large tree component) (see Appendix D for a map).

- Implement the following items listed in "Features Common to Alternatives 1, 2, 3, 6": Soils/Watershed Management, Aspen Management, Prescribed Fire and Wildland Fire Management Travel Management, Grazing Management, Southwestern Dwarf Mistletoe Management, Recreation Management

- Manage the ponderosa pine overstory vegetation to control dwarf mistletoe infection as much as possible given the vegetative structure ranges within the adopted goshawk guidelines and overall ecosystem needs. Treatment of B and C clumps or canopies is not restricted to maintaining a B or better canopy (except in wildlife corridor), therefore the control treatments are more rigorous than those of Alternative 1.

- The components removed from consideration for timber harvest are the same as Alternative 1 except moderate mistletoe infection sites in B canopies are available for treatment.

- The following prescriptions apply for stands treated with a timber harvest:

  **Sanitation (1943 Acres):** Same description as Alternative 1.

  **Intermediate (3147 Acres):** Same description as Alternative 1.

  **Group Shelterwood Seedcut (1372 Acres):** Same description as Alternative 1.

  **Overstory Removal (269 Acres):** Same description as Alternative 1.

  **Precommercial Thinning: (93 acres)** Same as Alternative 1.

  **General Guidelines**: Same as Alternative 1 except the limitations on B+ canopies do not apply except in wildlife corridors.

## FEATURES COMMON TO ALTERNATIVE 3 ONLY

Apply an ecosystem approach to managing the area that considers the biological needs of the area, including water, soils, overstory and understory vegetation, and wildlife habitat needs; and human desires for recreation, visual quality, safe access, use, and commodities. This approach emphasizes uneven-aged management. See Appendix D for a map.

- Implement the following items listed in "Features Common to Alternatives 1, 2, 3, 6": Soils/Watershed Management, Aspen Management, Prescribed Fire and Wildland Fire Management Travel Management, Grazing Management, Southwestern Dwarf Mistletoe Management, Recreation Management

- Manage the ponderosa pine overstory vegetation to control dwarf mistletoe infection as much as possible given the adopted goshawk guidelines and overall ecosystem needs. Since the critical habitat criteria limits even-aged treatments (and among them seedcuts, which are the single option for treating badly infected sites) to 25% of the total harvest acres, treatment of highly infected sites is limited to approximately 375 acres within the critical habitat unit. Total treatment acres within the critical habitat unit is also limited to approximately 1500 acres (no more than 20% of the critical habitat unit may have harvest activity if trees removed are greater than 12 inches DBH).

- The components removed from consideration for timber harvest are the same as Alternative 2, except sites moderately infected by DM are considered for treatment.

- The following prescriptions apply for stands treated with a timber harvest:

  **Sanitation (633 acres):** Same description as alternative 2.

  **Intermediate (969 acres):** Same description as alternative 2.

  **Unevenage (1460 acres):** All harvest sites occur within the MSO critical habitat. Retain the largest diameter trees until 25% of the largest diameter trees within the site have been accounted for. Within the balance of the site, remove trees from all age/size classes to retain the multi-age structure while reducing the stocking. Use uneven spacing. Use mistletoe as a priority criteria for tree selection. Maintain 40%+ canopy in stands identified as wildlife corridor. There are no treatments in moderate infection levels due to the inability to meet critical habitat criteria with an effective treatment for mistletoe.

  **Group Shelterwood Seedcut (802 acres):** Same description as alternative 1.

  **Precommercial Thinning: (93 acres)** Same as alternative 1.

  **General Guidelines:** Same description as Alternative 2.

## FEATURES COMMON TO ALTERNATIVE 4 ONLY
## (No Action Alternative)

Meet the NEPA requirements for assessing the impact on continuing the current management of the area at this time, except for activities considered by the Office of Government Counsel (OGC) not to be included in the ongoing type of activity. That activity currently ongoing that will be terminated is livestock grazing when the permit expires in 1999.

- Previously approved work will continue. Those projects are associated with the Crook and Baker timber sale area improvement plans.

- Continue current suppression of all wildfires. No prescribed burning proposals are proposed to reintroduce fire as a integral part of the ecosystem and reduce the severity of future wildfires.

- No project to improve the safety along State Highway 87 by reducing highway shading and tree hazards, and providing improved access to Forest Roads is proposed; a separate study by the Arizona Department of Transportation (ADOT) will likely occur.

- Livestock grazing is terminated.

## FEATURES COMMON TO ALTERNATIVE 5 ONLY

Meet the NEPA requirements for assessing the impact on continuing the current management of the area at this time, including no additional resource improvement projects or changes in the way livestock grazing, roads, or recreation uses are managed.

- The specific features are the same as Alternative 4 (No Action) except livestock grazing will continue under the current management scheme pending normal environmental reviews as part of permit issuance in 1999.

## FEATURES COMMON TO ALTERNATIVE 6 ONLY
## (Preferred Alternative)

Apply an ecosystem approach to managing the area that considers the biological needs of the area, including water, soils, overstory and understory vegetation, and wildlife habitat needs; and human desires for recreation, visual quality, safe access, use, and commodities. Meet the guidelines of the Mexican Spotted Owl Recovery Plan and the FEIS for Forest Plan Amendments (See Appendix D for a map). This is the preferred alternative.

- Implement the following items listed in "Features Common to Alternatives 1, 2, 3, 6": Soils/Watershed Management, Aspen Management, Prescribed Fire and Wildland Fire Management Travel Management, Grazing Management, Southwestern Dwarf Mistletoe Management, Recreation Management

- Manage the ponderosa pine overstory vegetation to control dwarf mistletoe infection as much as possible given the vegetative structure ranges within the Forest Plan Amendment for northern goshawks and the Mexican Spotted Owl Recovery Plan, and overall ecosystem needs.

- The components removed from consideration for timber harvest are the same as Alternative 1 except moderate mistletoe infection sites in B canopies are available for treatment.

- The following prescriptions apply for stands treated with a timber harvest:

  **Sanitation (171 Acres):** Remove dwarf mistletoe infected trees with tree ratings 4-6 in trees 9+ inches DBH and all trees with dwarf mistletoe if opening is no larger than 1/4 acre. Remove all trees less than 9 inches infected with dwarf mistletoe.

  **Intermediate (3787 acres):** Objectives will be to control/reduce dwarf mistletoe infections, maintain/create vertical and structural diversity, and reduce stocking to grow large trees quicker. Control/reduction of dwarf mistletoe will be accomplished with a sanitation type treatment as described in Sanitation above. Maintain/create vertical and structural diversity by (a) varying spacing and density by tree size, (b) creating openings up to 1/4 acre where dwarf mistletoe infections are high and (c) leaving approximately one clump per two acres with clumps generally being about 1/4 acre in size where the only potential removal will be trees up to 9 inches DBH, thereby retaining a variety of more dense canopies.

  A clump is defined as high density and/or closed interlocking canopy and/or multi-storied. Emphasize clump selection in yellow pine groups, squirrel nest areas, oak/pine interlocking thickets, dispersed camping sites, sites with an emphasis on VQO's, and archeological/historical sites. The Silviculturist will prioritize the above objectives based on existing site conditions, location, soil type, topographic position, etc.

  The objective of growing large trees quicker will be accomplished by leaving an average of 80 basal area (outside of the untreated clumps described above) in pockets with pretreatment stocking of 60 basal area or more. Stocking will average 80 basal area, but will vary from 60-100 basal area in these areas.

  **Regular Shelterwood Seedcut (260 acres):** Regular Shelterwood Seedcuts will be used on sites where the dwarf mistletoe infections are rated as high with infections throughout the site. The objective will be to regenerate the entire site with uninfected seedlings. The treatment will consist of leaving 30-50 basal area of the largest, healthiest, most vigorous seed trees over the majority of the site. Inclusions of groups of uninfected trees within the treatment area can be managed at an average of 80 basal area, but these inclusions will be insignificant in number/size and not affect the overall objectives or future management of the site. The resulting vegetation conditions will be left in an A canopy. Seedlings and saplings smaller than 5 inches DBH infected with dwarf mistletoe will be slashed. Fill-in planting will occur if the site does not regenerate.

  **Group Shelterwood Seedcut (36 acres):** Group Shelterwood Seedcuts will be used on sites where the dwarf mistletoe infections are rated as high, but there are significant pockets (20% or more of the area) of uninfected trees. A Regular Shelterwood Seedcut (see above paragraph) will be used where dwarf mistletoe infections doe occur. Where uninfected pockets occur, leave stocking will range from 60 to 100 basal. The uninfected trees will be used as seed trees and for shelter where they occur. The resulting vegetation conditions will be left in an A canopy with scattered pockets of Be and C canopies (approximately 20% of the site area). Seedlings and saplings smaller than 5 inches DBH

infected with dwarf mistletoe will be slashed. Fill-in planting will occur if the site does not regenerate.

**Prepatory Cut (694 acres):** Prepatory Cuts will be used on sites with moderate to high dwarf mistletoe infections. The objective will be to remove high risk dwarf mistletoe infected trees (as described in the Sanitation above) plus thin uninfected or low infected clumps of trees to 50-60 basal area. This will promote wind firmness, crown development and future cone producing capabilities on the healthiest and most vigorous trees on the site. Areas within the site that have no dwarf mistletoe infections will be managed in the 80-100 basal area range. The objective of this treatment is to produce an adequate supply of quality seed trees with no need at present for obtaining regeneration. However, the most logical treatment during the next entry would be some type of regeneration cut.

**Overstory Removal (122 acres):** Treat all dwarf mistletoe infected overstory where uninfected seedlings and saplings have become established. Slash infected understory. Trees 18-24 inches DBH that are potential snag recruitment trees will be baited with western pine beetle pheromone to induce mortality. Trees 24 inches DBH and larger will not be treated.

**Uneven-aged (112 acres):** Sites being managed with uneven-aged treatments were identified as presently being in an uneven-aged condition with stocking in at least three separate and identifiable age classes. These sites have some stocking in yellow pines and at least some quality structure. They may also have dwarf mistletoe infections that will limit the opportunities for treatment. Objectives for treatment will be to maintain/enhance structure and the yellow pine component.

Dwarf mistletoe infections will be treated where it will not greatly reduce structure quality. Trees 18-24 inches DBH that need to be treated are potential snag recruitment trees and will be baited with western pine beetle pheromone to induce mortality. Trees 24 inches DBH and larger will not be treated. Stocking control measures as described in the Intermediate Cut will be followed within each of the separate size classes, favoring the dominate and codominant trees.

**Aspen Treatments (20 acres):** The objective of this treatment is to maintain and enhance existing aspen clones. The treatments will include removal of most conifer trees up to 24" DBH, slashing of unmerchantable conifer trees (trees smaller than 5" DBH), prescribed burning of the site to induce/enhance suckering, and fencing with an elk-proof fence. Conifer trees 24" DBH and larger will not be removed with this treatment.

**General Guidelines**: Same as Alternative 1 except the limitations on B+ canopies do not apply.

# COMPARISON OF THE FEATURES OF ALTERNATIVES

See Appendix for additional tables and maps comparing alternatives.

| | ALTERNATIVE | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **ISSUE #1: Absence of Fire** | | | | | | |
| Utilizes prescribed fire. | Yes | Yes | Yes | No | No | Yes |
| **ISSUE #2: Lack of Diversity** | | | | | | |
| Moves toward balanced VSS. | Yes | Yes | Yes | No | No | Yes |
| Accelerates tree growth | Yes | Yes | Yes | No | No | Yes |
| Utilizes uneven-age prescriptions. | No | No | Yes | No | No | Yes |
| Utilizes thins from below. | Yes | Yes | Yes | No | No | Yes |
| Changes grazing system. | Yes | Yes | Yes | Yes | No | Yes |
| **ISSUE #3: Developing and Sustaining Old Growth** | | | | | | |
| Reduces impacts from dwarf mistletoe. | Yes | Yes | Yes | No | No | Yes |
| Emphasizes short term VSS concerns | Yes | No | Yes | No | No | No |
| Emphasizes long term VSS concerns | No | Yes | No | No | No | Yes |
| **ISSUE #4: Decline of Aspen** | | | | | | |
| Rehabilitates aspen patches. | Yes | Yes | Yes | No | No | Yes |
| **ISSUE #5: Demand for Recreation** | | | | | | |
| Rehabilitates compacted sites. | Yes | Yes | Yes | No | No | Yes |
| Sets management strategy for Cinch Hook snowplay area. | Yes | Yes | Yes | Yes | Yes | Yes |
| Sets management strategy for forest road 608. | Yes | Yes | Yes | Yes | Yes | Yes |
| **ISSUE #6: Transportation Watershed/Safety** | | | | | | |
| Treats road/watershed conflicts. | Yes | Yes | Yes | No | No | Yes |
| Treats highway 87 roadside safety concerns. | Yes | Yes | Yes | Yes | Yes | Tes |

**Figure 1**
**Timber Outputs**

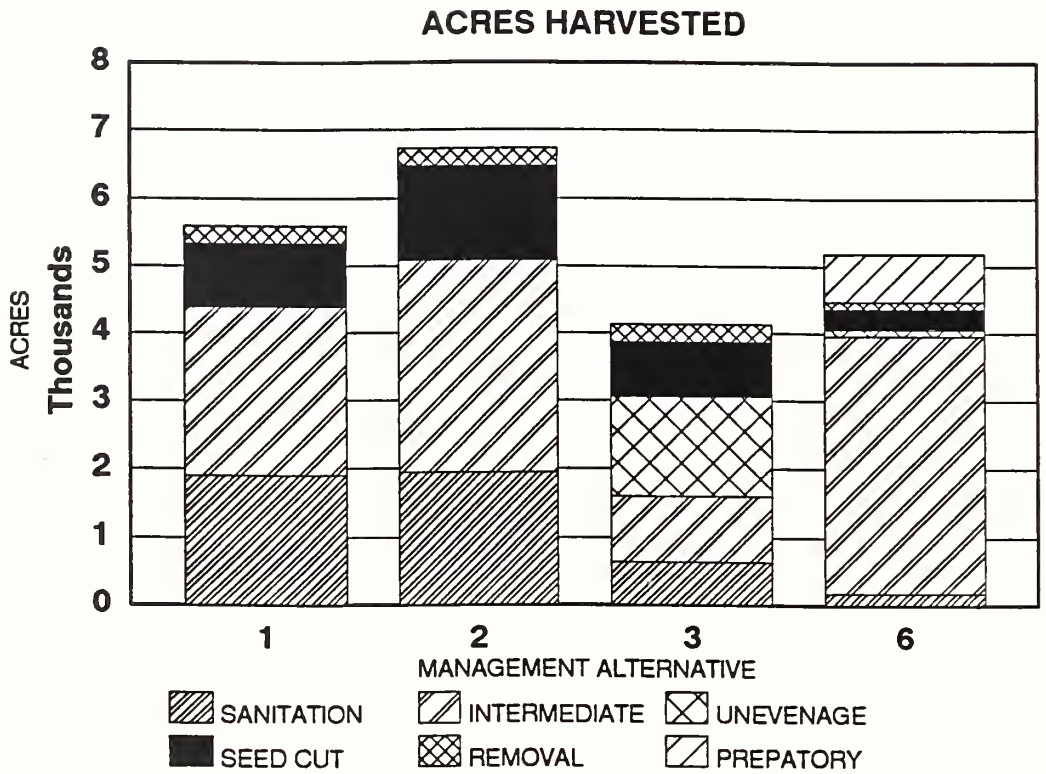



Table 3: Range of Harvest Volumes

| ALTERNATIVE | RANGE OF MBF HARVESTED * |
|---|---|
| | |
| 1 | 7200-11000 |
| 2 | 8700-13000 |
| 3 | 5200-7900 |
| 4 | 0 |
| 5 | 0 |
| 6 | 6700-10000 |

* estimate based on sampling design error of 20% and from yield of similar timber sales.

# CHAPTER 3 - EXISTING LANDSCAPE CONDITION

This chapter describes the current condition of the landscape by detailing the:

- terrestrial ecosystem
- structures (dominant vegetation (matrix) and patches)
- corridors (roads, trails, wildlife corridors, stream corridors)

**Note: A number appearing in parentheses (i.e. (147) refers to a specific document in the Process Record Index included in the appendix. The Pocket/Baker Project Record Folder to which the Index refers is available for viewing at the Long Valley Ranger District Office at Happy Jack, AZ.**

## POCKET/BAKER LANDSCAPE

### TERRESTRIAL ECOSYSTEM

In their review of the status of knowledge in Southwestern ponderosa pine forests, Tecle and Covington (1991) find that the Terrestrial Ecosystem Survey (TES) is one of the most effective and integrated approaches to classifying ecosystems and interpreting management activities. Tables 4 and 5 describe the TES soil groups and vegetation relationships (100).

The parent materials of soils in the matrix of the Pocket/Baker ecosystem fall into three major groups based on bedrock composition: sandstone, limestone, and basalt. Sandstone soils are naturally extremely erodible. Lack of ground cover contributes to the erodibility of the sandstone soils in the Pocket/Baker ecosystem. The greater the presence of limestone and basalt, the less erodible and more productive this soil type becomes. Climate and a lack of surface organic matter contributes to the soil's low productivity.

Limestone soils are generally deep, well developed soils which support the highest ponderosa pine and fir tree growth. Soils derived from limestone are generally not very erosive due to the presence of ground cover (forest litter and vegetation). However, where roads have been located in filter strips, the associated activities (log landings and skidding, machine piling and dispersed recreation) have removed the ground cover and accelerated runoff has created active headcuts in drainages (in Corduroy Wash in TES 549) (66).

All basalt derived soils are subject to compaction problems when wet due to high clay content.

TABLE 4: SUMMARY OF SOIL GROUPS

| Soil Group | % of Area | Summary |
|---|---|---|
| Sandstone | 16% | Low vegetative productivity; lack of ground cover accelerating erosion (TES #'s 572, 573). |
| Sandstone/ Limestone | 22% | Low vegetative productivity; moderate to severe erosion hazard (TES #'s 550, 555, 567, 571, 574, 651). |
| Sandstone/ Basalt | 3% | Low vegetative productivity; slight to moderate erosion hazard (TES #'s 532, 571). |
| Limestone | 23% | Highest vegetation growth potential; slight to moderate erosion hazard (TES #'s 53, 546, 549, 576). |
| Basalt | 33% | Low to moderate vegetation productivity; slight to severe erosion hazard (TES #'s 55, 493, 494, 534, 550, 565, 578, 579, 582, 584, 585, 586). |
| Other | 3% | Includes dacite (mixed conifer soil group) and rock outcrops (TES #'s 596, 611, 654). |

TABLE 5: SOIL/VEGETATION RELATIONSHIPS

| TES Unit | % of Area | Vegetation Type |
|---|---|---|
| 493, 494 | 2% | Pinyon-Juniper, Arizona white oak, blue grama grass. |
| 53, 55 | <1% | Kentucky bluegrass, western wheatgrass. |
| 532, 534, 571 572, 573, 574 | 24% | Ponderosa pine, alligator juniper, Arizona white oak, manzanita. |
| 576 | 2% | Ponderosa pine, alligator juniper, manzanita. |
| 46, 549 | 21% | Ponderosa pine, Gambel oak, screwleaf muhly. |
| 550, 565, 582 584, 585, 586 | 35% | Ponderosa pine, Gambel oak, Arizona fescue, squirrel tail, pine dropseed, sedges. |
| 555, 596 | 3% | Douglas-fir, ponderosa pine on drier exposures. |
| 567, 578, 579 | 10% | Ponderosa pine, alligator juniper, Gambel oak. |
| 611, 651, 654 | 3% | White fir, Douglas-fir, ponderosa pine, Gambel oak. |

Note: Understory species (grasses) when listed indicates the native species present. Management activities have introduced and displaced native species with nonnative species like orchardgrass, smooth brome, and wheatgrasses. Introduced species are present in all soil groups where ponderosa pine occurs.

# LANDSCAPE MATRIX

## PONDEROSA PINE COMMUNITY

### Historical Perspective

Early accounts of the vegetation in the ponderosa pine country on and around the Mogollon Rim include reports from archeological investigations among the Indians of the Southwest from 1880 to 1885, Lieutenant John Bourke, who served with General George Crook and later wrote of his experiences, and Martha Summerhayes, a young Army wife accompanying her lieutenant husband to Fort Apache in 1874. In the final report of the archeological investigations the trees in the area are described as "farther apart than in better irrigated sections, and the majority of the valleys present a series of groves, instead of connected forests" (Bandelier 1890) and as a "stately forest of pines, - splendid, straight trees, all Pinus ponderosa" (Bandelier 1892). Bourke (1891) described an "immense pine forest" with a "wealth of timber which would one day be made tributary to the world's commerce", and was at times "so even

and clear that we were riding five and six abreast," yet was "so dense a forest that the Apaches could not see any distance ahead..." During the expeditions, the party traveled west along the Rim. It was rough going, but they found water supplied in small lakes and tanks. To turn northward to any degree put them into increasingly deep and rugged canyons. When the party entered the country occupied by the Tonto Apaches, Bourke recalls, "We were riding along a very lovely stretch of pine forest one sunny afternoon, admiring the wealth of timber... looking down upon the ever-varying colors of wild flowers... We were riding five or six abreast..."

Summerhayes (1979) in her accounts of life in Arizona at the turn of the century describes her first glimpse of the Mogollon Rim: "The scenery was wild and grand, in fact, beyond all I had ever dreamed of..." and of the forest at a Mogollon Rim camp as "a primeval grove of tall trees."

Cooper (1960) concludes, "The overwhelming impression one gets from the older Indians and white pioneers of the Arizona pine forest is that the entire forest was once much more open and park-like than it is today." These forest stands were characterized by well-spaced older trees and sparse pockets of younger trees, vigorous and abundant herbaceous vegetation, and infrequent accumulations of large, woody debris. These conditions reflect an uneven-age stand structure composed of small, relatively even-aged groups (Sackett and others 1993).

Although most accounts exalt the large pines and openness of the forest, evidence of pine reproduction also exists. Plummer (1904), in his description of the Black Mesa Forest Preserve which included the Mogollon Rim, found exceptionally heavy stands of young trees in some places. Cooper (1960) cites the Leiberg and others' (1904) account of areas of the Arizona pine forest where reproduction was lacking (San Francisco Mountain Forest Preserve) and other areas where reproduction was very good (Prescott National Forest).

Though these descriptions may not be of the specific area of the Pocket/Baker ecosystem, the account matches those of Bandelier, Bourke, and Summerhayes and inventory data taken in the early 1900's when the Mogollon Rim was part of the Black Mesa Forest Reserve (Plummer 1904). Beard (1995), in his discussion of the changes in scenic conditions in the forests of Arizona and New Mexico, states that because early photographs of the Southwest forest generally agree with written description from the 16th and 18th centuries leads us to believe perhaps the landscape maintained some degree of consistency over time, and that the photographs from the 1880's and from as late as the 1920's could represent the general forest character over the past few centuries at least.

We know from numerous accounts that prior to European settlement, these forests of the Southwest were maintained by fires at regular intervals. The sources of these fires were both natural and man-caused. Pyne (1982) states that virtually all native peoples prior to the 1880's used fire as a major land management tool. Irregardless of the source of ignition, light surface fires within ponderosa pine stands occurred usually at less than 10 year intervals (Dieterich 1980) These fires created the uneven-aged stand structure composed of small, relatively even-aged groups of trees discussed above (Harrington and Sackett 1990).

## Changes Over Time

A comparison of existing vegetation within the Pocket/Baker ecosystem with concise descriptions provided by early surveyors and foresters (Plummer 1904, Drake 1910) is displayed in Table 6. After a century of post-European settlement and use in the area, the character of the Southwestern ponderosa pine forest in this area changed considerably. Trees are younger and smaller, the floral diversity is

lower, and the litter layer, both litter and woody material, is heavier now than at the turn of the century. These changes are generally attributed to livestock grazing, fire suppression, and, in recent years, lumbering that followed European settlement of the area.

Table 6: COMPARISON OF VEGETATION BETWEEN 1900-1910 AND 1990 (81).

| Vegetative Attribute | 1900-1910 | 1990 |
|---|---|---|
| Average tree age(yrs) | 150-190 | 40-100 |
| Average height (ft) | 70-100 | 30-60 |
| Average DBH* (in) | 14-22 | 8-14 |
| Dominant VSS** | 5 and 6 | 3 and 4 |
| Secondary VSS | 3 and 4 | 2 and 5 |
| Floral diversity | very high (pre-1880) | very low |
| Litter layer | very light to light | light to deep |

*DBH: diameter at breast height (4 1/2 feet above ground)
**VSS: vegetative stand structure
2= saplings, 3= poletimber, 4 = sawtimber, 5 and 6 = "old-growth."

## Vegetative Communities

The dominant vegetative overstory community is ponderosa pine (92% of the Pocket/Baker ecosystem). The ponderosa pine vegetation type may be associated with alligator juniper, Gambel oak, aspen, bigtooth maple, Arizona white oak, and tree-sized New Mexico locust within the overstory. Bigtooth maples are located in draws and drainages as fragmented patches on about a dozen occurrences. Understory species include manzanita, New Mexico locust, bracken fern, ceanothus, and native grasses such as squirrel tail and Arizona fescue. Ponderosa pine is often subdivided into pine/alligator juniper or pine/Gambel oak communities.

### *Gambel Oak*

Gambel oak is prevalent within ponderosa pine and mixed conifer stands on approximately 70% of the Pocket/Baker ecosystem. On the average, there is approximately 7 basal area of Gambel oak within pine/oak stands. Very few stands (285 acres) were inventoried on the Baker portion of the Pocket/Baker ecosystem with oak basal areas of 15 basal area or greater. Oak basal area on the Pocket side, though not sampled, is expected to be similar. The range of diameters of oak groups is rather equally spread.

Gambel oak is important to a wide variety of animals and is an integral part of the food chains and webs important for nutrient cycling and energy flow to maintain a healthy ecosystem. Arthropods, (insects, spiders, etc.), which live on the leaves, branches, and trunk of the oak tree provide food for birds and bats that have specialized feeding habits. Deer mice, an important prey species for the Mexican spotted owl, gray fox, and others, were found associated with oak in a study conducted by Irvine (1991). Young Gambel oak provides hiding cover for deer, elk, and turkey, while older trees provide thermal cover for the same species.

There are 61 different types of birds on the Coconino National Forest that utilized Gambel oak to meet a variety of habitat needs. Of these, 46% are classified as Neotropical Migratory Birds (USDA 1991a). Gambel oak contributes significantly to the available tree cavities for nesting and roosting (Balda 1975). The large, gnarled tops of oaks are used as roosting and nesting areas for birds (Steinhoff 1978); oak cavities are frequently used as nest sites for the Mexican spotted owl. The range of the band-tailed pigeon coincides with the range of Gambel oak (Neff 1947).

Acorns are a food source high in proteins. Reeves and Swank (1955) found acorns constituted about 46% of the volume and occurred in 78% of the examined crops of Merriam's turkeys. They also noted an increase of acorn content in percent frequency in the turkey droppings from November (8%) through February (55.2%). Wakeling (1991) indicated that there was a correlation between Gambel oak mast (acorn) production and mortality rates of turkey. Acorns have been documented to influence deer numbers by influencing fawn production and survival (Inlay 1971). Acorn woodpeckers depend upon acorns, which they eat as fresh mast in the autumn and store in specialized storage trees called granaries. Stored acorns are critically important to overwinter survival and reproductive success for these birds (Weathers and others 1990).

Gambel oak has been subject to theft by firewood cutters; this illegal activity is widespread in the Pocket/Baker area.

### *Alligator Juniper*

Alligator juniper is associated with ponderosa pine (on 26% of the area) and Gambel oak (on 10% of the area), and with pinyon (on 2% of the Pocket/Baker area). It is slow growing and long-lived, sprouting easily after disturbance (mechanical or fire). Junipers can produce berries as early as 10-20 years of age (Johnson and Alexandar 1974). The berries are utilized by many bird species, while some mammals also consume alligator berries.

Young alligator junipers provide hiding cover, while larger trees provide nesting cover for birds including scrub jays, pinyon jays, and blue-gray gnatcatchers (DeGraff and others 1991). These larger trees are used frequently by deer and small mammals for protection from weather. As many as 4-5 elk at a time have been observed bedded down under large alligator junipers (Abott 1991).

Large alligator junipers have been subject to theft by firewood cutters. This is particularly true in the western edges of the Pocket 10K.

### *Understory Species*

Through past timber harvest activities (opening canopy and pile and burn), the presence of bracken fern and New Mexico locust has increased. Native forage grasses have decreased due to seeding of nonnative species following timber harvests. Openings created by timber harvest, still have a high proportion of bare ground (81). Within the Baker portion, herbaceous cover under stands treated by timber harvest in the 1970's and 80's is still meager (81). Grazing practices and the lack of fire are also major contributors. Overall, herbaceous conditions on Baker Butte portion can be described as being in a static to slightly upwards trend when compared to conditions that existed in 1970 (81).

*Understory-Overstory Relationship*

With an increase in canopy closure from growth within ponderosa pine, there is a corresponding decrease in grasses and forbs. Studies in the ponderosa pine/fescue bunchgrass community at the Wild Bill Range just north of Flagstaff, Arizona showed that there was an inverse logarithmic relationship between understory herbage production and overstory pine basal area (Tecle and Covington 1991). On basaltic soils in the Beaver Creek Watershed southwest of Happy Jack, Arizona, Clary and Ffolliott (1966) found that herbage production was significantly greater on a thinned stand than on an adjacent unthinned stand when basal areas were below 70. Above 100 basal area, unthinned stands had statistically insignificant greater herbage production. Dieter (1990) found that cool season plants showed a much stronger relationship to overstory density than did warm season plants. Generally, realizing full production in the understory does not occur until 6-15 years after overstory thinning (Tecle and Covington 1991).

The effect of slash on understory production is a function of the amount and size class of the tree removed and how the slash is treated. Slash accumulations on heavily harvested sites have caused decreased herbage production (Arnold 1953; Schubert 1974). Reynolds (1962) in studies on the North Kaibab found that where slash was piled or piled and burned, forb species increased and the areas became heavily used by cattle. He also found that deer preferred areas where the slash was left in place, even though forbs (preferred by deer) were found in greater concentrations on sites where slash had been piled. And while reduced canopy cover (from logging) resulted in an increase in herbaceous understory vegetation, Arnold (1953) found in many cases that ground disturbance and heavy slash accumulation negated or overshadowed understory vegetation gains from overstory reduction.

Little information appears to be available on the interactions among overstory reduction, soil disturbance, and slash accumulation as they relate to understory vegetation production, though the cumulative effects may be neutral to negative for increased understory vegetation production (Tecle and Covington 1991).

*Vegetative Stand Structure (VSS)*

The ponderosa pine community is predominantly mid-sized (9-18 inches in diameter) immature (vegetative stand structure (VSS) 3 or 4) growing in open or moderately open sites (canopy closure less than 60%). The large tree component (greater than 18 inches in diameter) is generally missing on Milk Ranch Point, and mostly scattered in remnant groups throughout the rest of the Pocket/Baker ecosystem. The heaviest concentrations of large trees are along state highways 87 and 260, and in the Baker Butte area. Table 7 illustrates the distribution of sizes, relative age, and canopy closure for ponderosa pine stands within the Pocket/Baker ecosystem.

TABLE 7: VEGETATIVE STAND STRUCTURE FOR PONDEROSA PINE *

| Vegetative Structure | Symbol | Acres | % of Area |
|---|---|---|---|
| Unstocked Openings | 1 | 31 | 0 |
| Seedling/Sapling | 2 | 196 | 1 |
| Young Forest: | | | |
| Open | 3A | 6044 | 28 |
| Moderately Closed | 3B | 3336 | 15 |
| Dense | 3C | 1180 | 5 |
| Mid-aged Forest: | | | |
| Open | 4A | 3487 | 16 |
| Moderately Closed | 4B | 4232 | 19 |
| Dense | 4C | 1876 | 8 |
| Mature Forest: | | | |
| Open | 5A | 643 | 3 |
| Moderately Closed | 5B | 554 | 2 |
| Dense | 5C | 474 | 2 |
| Old Growth: | | | |
| Open | 6A | 0 | 0 |
| Moderately Closed | 6B | 136 | 1 |
| Dense | 6C | 88 | 0 |

| Overstory Canopy Coverage | Symbol | Acres | % of Area |
|---|---|---|---|
| Open (less than 40%) | A | 10401 | 47 |
| Moderately Dense (41-60%) | B | 8258 | 37 |
| Dense (greater than 60%) | C | 3618 | 16 |
| | TOTAL | 22277 | 100 |

* Also includes mixed conifer vegetation type (495 acres).

***Ponderosa Pine Growth***

A table indicating the effect of stand density on growth is in the Appendix E. Based on information collected at Taylor Woods (north of Flagstaff, AZ), the data show that for trees around 7-12 inches DBH, that there are 10 year basal area increases ranging from 20-40 basal area depending on the initial basal area density of 30-116. Decade diameter increases ranged from 3.0 to 1.1 inches, depending on initial basal area. The estimated time to reach an 18 inch tree (adequate size for snag recruitment) ranges from 16-105 years depending on the initial basal area. The following table approximates the results of the basal area/growth relationships found at Taylor Woods (trees free from dwarf mistletoe).

Table 8: GROWTH/BASAL AREA RELATIONSHIPS

| Avg. DBH | Initial BA | Initial BA Plus 10 Years | Decade Diameter Increase | Years to 18" DBH |
|---|---|---|---|---|
| 10 | 30 | 50 | 3.0 | 20 |
| 9 | 60 | 85 | 1.9 | 40 |
| 9 | 70 | 100 | 1.5 | 60 |
| 8 | 90 | 120 | 1.3 | 70 |
| 8 | 110 | 140 | 1.4 | 70 |
| 7 | 120 | 160 | 1.0 | 100 |

***Seedlings/Saplings (VSS 2)***

VSS 2 is an early successional stand dominated by seedlings and saplings with an average diameter less than 5 inches, and generally less than 10 feet tall. These result generally from wildfire or seed cuts that have been regenerated and the overstory has been removed or is a minor component (when compared to the overall basal area of the stand). Currently, there are 196 acres of sites in seedling/saplings (where VSS 2 is the dominant vegetation structure). There are, however, numerous small clumps of seedlings and saplings that occur as small patches within other VSS designations; this occurrence is estimated to be on 4% of the Pocket/Baker area.

***Mature/Old Growth (VSS 5 or 6)***

There are 1895 acres of the mature/old growth age class in the Pocket/Baker ecosystem. Yet not all of these acres are defined as old growth by the Forest Plan due to differences in definitions of old growth between the Forest Plan and the vegetative structure classification system. The VSS system simply does not determine the function of a stand, whereas old growth definition in the Forest Plan addresses stand size, snags, dead and down, and multi-layered canopies. Consequently, not all the acres of mature/old growth may be tabulated against the Forest Plan standards for old growth.

For the Forest Plan definition, there are 517 acre of existing old growth (all in the Baker portion) which equals 2.8% of the Pocket/Baker ecosystem. The old growth sites are scattered throughout the 10K. There are two areas where adjacent sites combine into areas $\geq$100 acres (the Forest Plan standard for minimal old growth site size). Within the Pocket 10K, there are 3 sites classified as VSS 6 (78 acres), but do not meet the Forest Plan guidelines for old-growth due to stand size.

Within the 1772 acres to be managed as developing old growth, dwarf mistletoe is widespread with 45% (471 acres) of the developing old growth in a low rating, 45% (472 acres) with a medium rating, and 9% (92 acres) with a high rating. On 9 June 1992, a couple of the mistletoe infected developing old growth sites were visited by Arizona Game and Fish personnel, Rick Miller and John Goodwin, and Pocket 10K analysis IDT members. The consensus was that these infected mistletoe sites would be best left designated as developing old growth with no planned harvest treatment. Therefore, the 101 acres of developing old growth with a high mistletoe rating will probably never reach old-growth status. The treatment would be so extensive that the site would probably convert to pinyon and/or juniper.

Untreated, the mistletoe will stagnate the site, and the site would not develop into old-growth. However, it will function as old-growth, or at least close to an old-growth condition for a period of time.

## WILDLIFE HABITATS

### *Snag Habitat*

A snag deficit exists within the Pocket/Baker Pocket/Baker ecosystem. Sites meeting the Forest Plan minimum for snags (200/100 acres) were identified on 2888 site acres, or 13% of the Pocket/Baker ecosystem. The Forest Plan minimum is that 50% of the forested area meet 200 snags per 100 acres. Potential snags (culls, spiketops, and/or faders) do not exist in sufficient numbers within any particular site. Therefore, the recruitment of future snag habitat will have to come from existing live trees.

### *Cover Habitat*

Total existing cover equals 10,196 acres, or 45% of the Pocket/Baker ecosystem's forested acres. The existing cover acres exceeds the Forest Plan minimum guideline (of 30%) by 15%. The quality and quantity of the cover, particularly the hiding cover within the ponderosa pine vegetative type, is attributed to the interspersion of non-commercial species (Gambel oak, Arizona white oak, maple, alligator juniper, New Mexican locust, and manzanita).

### *Turkey*

For nesting habitat, turkeys use drainages with greater than 30% slopes, greater than 60% overstory (C canopy); clumps of multi-aged trees positioned against some kind of backdrop (either a large tree trunk, log, shrub, thicket of deciduous tree regeneration, or rock); horizontal cover for approximately 7 feet surrounding the nest and dense to about 18 inches from the ground level; and dependable water within one-half mile (National Turkey Federation 1991). The site structure should include sapling and pole sized conifers and deciduous trees. A slash component is also desirable for horizontal ground cover. Nesting sites should also be within close (0.5 mile) proximity to suitable brooding habitat; which includes an interspersion of small openings for foraging, escape trees, and cover (both hiding and thermal) for the poults. Approximately 8% of the Pocket 10K and seventeen sites in the Baker 10K were identified as suitable for nesting.

A total of 45 roost sites were identified in the Pocket/Baker Pocket/Baker ecosystem.

### *Abert Squirrel*

Studies have shown Abert squirrel habitat to consist of multi-storied sites of small to large sawtimber (11" to 14" DBH and 17" to 20" DBH) size classes (Brown 1984). The highest use, by Aberts within these size classes, is where the trees have interlocking crowns to provide canopy closure of 40% or better. These tree size classes and canopy closures would be described as vegetative structural stages 3B, 3C, 4B, and 4C. The diverse structure created by a multi-storied tree canopy provides suitable nesting habitat, protection from predators and weather; and food sources in the way of cones, twigs, and buds.

Dwarf mistletoed areas on trees provide an enhanced foraging situation for Abert squirrels. The areas of infection create more succulent and nutrient rich interbark areas. Abert squirrels take advantage of the infected interbark areas as an improved food source. Truffles (underground fungal fruiting bodies) are also used as a food source during the summer and fall of wet years. The truffles are most commonly found under closed canopied blackjack Site conditions.

All sites within the Pocket/Baker ecosystem were given an Abert squirrel habitat rating based on Patton's (1984, 1991) Abert squirrel habitat capability model. Sites were rated as to excellent, good, fair, and poor. Sites totaling 10,948 acres (50% of the Pocket/Baker ecosystem) were rated as excellent, good, or fair. Some of these sites are actively used by Aberts; others are considered potential habitat. Forest Plan guidelines call for managing at least 20% of the potential habitat for Abert squirrels.

***Mexican Spotted Owl***

The 1990 Pocket surveys resulted in locating a pair of MSO in Calf Pen Canyon, and the subsequent establishment of management territory (MT) #040421. This MT was informally monitored during 1991, 1992, and 1994. A single MSO female was heard in 1991, and MSO pairs were heard in 1992 and 1994. Monitoring was not conducted in 1993. No attempts were made to determine nesting status, due to the rugged, inaccessible terrain of Calf Pen Canyon.

The 1993 Pocket surveys resulted in locating a pair of MSO with one young in Sandrock Canyon, and the subsequent establishment of MT #040103. Informal monitoring of this MT in 1994 resulted in locating a single male MSO.

An unrelated survey conducted in 1989 resulted in a single auditory response from a single owl (sex undetermined) above Pivot Rock Canyon. A second survey conducted in Pivot Rock Canyon, the night after the initial response, did not produce any results. Despite the lack of substantial survey results, MT #040412 was established. This MT has been formally monitored in 1991, 1992, and 1993; and informally monitored in 1994. All monitoring efforts resulted in "no response". Monitoring was not conducted in 1990.

A 1991 inventory survey conducted by personnel from the Payson Ranger District, Tonto National Forest located a pair of MSO's with one young in Pine Canyon; and resulted in the establishment of MT #120413. Informal monitoring of this territory occurred in 1992 (Payson R.D.) and in 1994 (Long Valley R.D.). A pair was heard in 1992, and a single male was heard in 1994.

Inventory surveys were conducted by personnel from the Payson Ranger District, Tonto National Forest in 1994. These surveys were done along the Mogollon Rim to survey the area below the Rim, on the Payson Ranger District. These 1994 surveys resulted in the establishment of two additional MT's (#120415 and #120419) below the Rim, east of Milk Ranch Point. Establishment of MT #120415 was based on locating a pair of MSO's with one young; and that for MT #120419 was based on locating a pair of MSO's with two young.

The Final Mexican Spotted Owl Recovery Plan was issued in December 1995, represents the current state-of-knowledge, and identifies the Pocket/Baker area as being in the Upper Gila Mountain Recovery Unit. The majority of the known Mexican spotted owls occur in this recovery unit. Therefore, this unit is considered a critical nucleus due to its central location within the owl's range and its high density of owls (USDI 1995). Management territories were modified to meet requirements for the protected activity center (PAC) as identified in the MSO Recovery Plan.

There are three levels of protection recommended by the recovery plan for the Mexican spotted owl as it applies to the Pocket/Baker ecosystem: protected, restricted, and other forest and woodland types.

**Protected areas** include the protected activity center (PAC) of 600 acres placed at known or historical nest and/or roost sites, reserved or withdrawn lands (like wilderness), and slopes greater than 40% that have not been logged in the last 20 years. There is a small portion of one PAC in the Pocket/Baker area. There are numerous PAC's adjacent to Pocket/Baker lands. There are 1,091 acres of protected habitat within Pocket/Baker.

**Restricted areas** include the ponderosa pine-Gambel oak and mixed conifer stands. Timber harvest is allowed with prescriptions that move sites toward nest and roost habitat. Trees larger than or equal to 24 inches DBH are excluded from harvest. Adequate down woody material, standing and recruitment snags are retained. There are 11,245 acres of restricted habitat within Pocket/Baker.

**Other Forest and Woodland Types** include ponderosa pine without Gambel oak and pinyon-juniper woodlands. There are no limitations, and management for landscape diversity is recommended. There are 10,381 acres of this habitat.

Proposed critical habitat was issued on December 7, 1994 for the Mexican spotted owl (shown on a map in Appendix D) as it applies to the Pocket/Baker ecosystem. Approximately 17,300 acres are within critical habitat unit (CHU) AZ-CCNF-2. The FWS in February 1995 issued criteria to quantify detrimental effects within critical habitat units. The FWS has since finalized these criteria and now refer to an adverse affect to critical habitat as anything that is not consistent with the Recovery Plan. Therefore, a "may affect" determination is to be made should any action modify current critical habitat conditions beyond the criteria. Map 2 indicates the levels of habitat protection defined by the Recovery Plan.

**Map 2**
**LEVELS OF HABITAT PROTECTION**

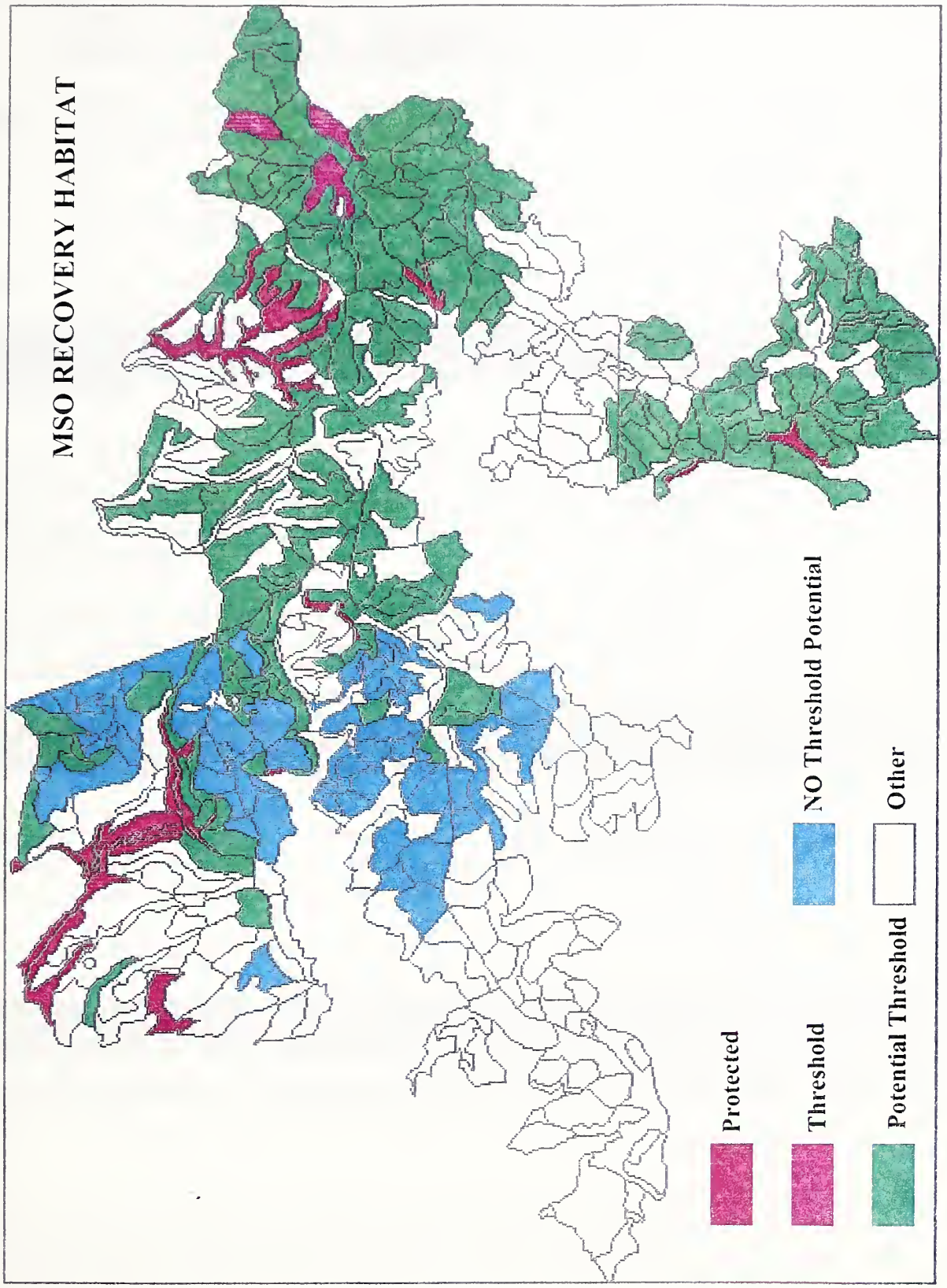


Table 9 displays acreage of levels of habitat defined by the MSO Recovery Plan.

Table 9.
MSO Recovery Plan Habitat Designations

| Management Areas | Pocket | Baker | 20K |
|---|---|---|---|
| **Protected Areas:** | | | |
| PAC's | 0 | 198 | 198 |
| Steep Slopes (outside PAC's) | 229 | 275 | 504 |
| Reserved Lands | 389 | 0 | 389 |
| TOTALS | 618 | 473 | 1091 |
| % OF THE 20K | | | 5% |
| **Restricted Areas:** | | | |
| Mixed-conifer | | | |
| MCTH | 0 | 85 | 85 |
| MCPT | 0 | 334 | 334 |
| Pine/oak | | | |
| POTH | 0 | 116 | 116 |
| POPT | 1325 | 6575 | 7900 |
| PONP | 2810 | 0 | 2810 |
| Riparian | 0 | 0 | 0 |
| TOTALS | 4135 | 7110 | 11245 |
| % OF THE 20K | | | 49% |
| **Other Forest & Woodland Types:** | | | |
| Ponderosa Pine | 6152 | 3741 | 9893 |
| Spruce-Fir | 0 | 0 | 0 |
| Pinyon-Juniper | 488 | 0 | 488 |
| Aspen | 0 | 0 | 0 |
| TOTALS | 6640 | 3741 | 10381 |
| % OF THE 20K | | | 46% |

**MCTH**: mixed-conifer vegetation type which currently meets MSO target threshold conditions for nesting/roosting.

**MCPT**: mixed-conifer vegetation type which has the potential of developing into MSO target threshold conditions for nesting/roosting.

**POTH**: ponderosa pine/Gambel oak vegetation type which currently meets MSO target threshold conditions for nesting/roosting.

**POPT**: ponderosa pine/Gambel oak vegetation type which has the potential of developing into MSO target threshold conditions for nesting/roosting.

**PONP**: ponderosa pine/Gambel oak vegetation type which does not have the potential of ever meeting the MSO target threshold conditions for nesting/roosting.

***Northern Goshawk***

The principle forest types occupied by the goshawk in the southwest are ponderosa pine, mixed species and spruce-fir. The goshawk is a forest habitat generalist that uses a wide variety of forest ages, structural conditions and successional stages for nesting and foraging. Most of the Pocket/Baker ecosystem can be considered foraging habitat for goshawks, but there is relatively little nesting habitat due to the lack of a large tree component.

Northern goshawk nesting areas are usually located on northerly aspects in drainages or canyons, and are often near streams. Nest areas contain one or more stands of large, old trees with a dense canopy cover. According to the Goshawk Scientific Committee Recommendations (GSC) (Reynolds and others 1992), suitable nest site attributes includes having VSS 5 or 6 in groups or clumps. The post-family fledgling area (PFA) surrounding the nest site should be 54% B+ canopy and 6% C canopy. A goshawk pair occupies their nest area from early March until late September.

Within the Baker 10K, stands which have potentially suitable nesting sites were identified on the ground by personnel conducting field inventories in 1993. A total of 43 stands (1,947 acres) were located. Within the Pocket side, a total of 38 stands (1,830 acres) were identified as potential nesting stands utilizing vegetation inventory data and aerial photographs.

Much of the 22,277 acre analysis area can be considered foraging habitat. There are very few natural openings or large areas without trees present that would be considered unsuitable. However, there are areas of pinyon/manzanita scrub land on the Pocket 10K that would not be considered good foraging habitat due to lack of hunting perches and the presence of thick impenetrable understory. There are also nearly 10,000 acres of VSS 3A and 4A that are considered poor foraging habitat because the stands are very open, young, with little vegetative structure and relatively little dead and down material. The quantity and diversity of prey species is expected to be lower within these stands. Approximately 12,500 acres within the Pocket/Baker ecosystem is considered "good" foraging habitat.

There are no known goshawk nest sites in the Pocket/Baker ecosystem area. In the Baker 10K, survey efforts by contractors utilizing the survey protocol developed for the Southwestern Region of the Forest Service by Kennedy and Stahlecker (1991) failed to locate any goshawks in 1992, 1993 or 1994. There were several sightings of goshawks by District personnel in 1993. In the Pocket 10K, survey efforts in

1991 and 1993 failed to locate any goshawks, though District personnel reported goshawk sightings in 1991 and prior. Since all the sightings were widely spaced throughout the area and no nests, either recent or historic, have ever been located, no management territory has been established (164).

### *Flammulated Owl*

Locations for seventeen flammulated owls were plotted from auditory observation made during the MSO inventory surveys completed for the 20K. Thirteen (13) of these observations were made in the Baker 10K, and the remaining four (4) were in the Pocket 10K. Two additional flammulateds were heard outside the 20K boundary.

### *Arizona Cinquefoil*

A population of this Forest Service sensitive plant was located in a drainage which marks the northern boundary of Location 668 (Sites 18, 21, & 22) of the Pocket 10K. No other TE&S plant species were identified during the inventory surveys (164).

### *Peregrine Falcon*

The essential habitat for peregrine falcon includes rock cliffs for nesting, and a large foraging area. Suitable nesting sites on rock cliffs have a mean height of 200 to 300 feet. The peregrine occurs state wide as a migrant, transient and/or wintering individual. The subspecies anatum breeds on selected isolated cliff ledges, and is a permanent resident on the Coconino National Forest.

Peregrines prey mainly on birds found in wetlands, riparian areas, meadows, parklands, croplands, mountain valleys, and lakes within a 10 to 20 mile radius from the nest site. Bats have also been identified as prey species (USDI 1984). Peregrines can be very sensitive to disturbance during the breeding season which is from March 1 to August 31.

The escarpment of the Mogollon Rim provides essential nesting habitat along the rock cliffs; and foraging habitat above and below the edge of the Rim. Use of the Rim, by nesting peregrines, has been documented through monitoring surveys conducted by the Arizona Game and Fish Department since 1989. Three peregrine nesting sites (eyries) exist within close proximity to the Pocket/Baker ecosystem. All three are located on the Tonto National Forest, immediately below the Mogollon Rim.

### *Threatened, Endangered, and Sensitive Species*

Except for the species listed above (Mexican spotted owl, northern Goshawk, flammulated owl, Arizona cinquefoil, peregrine falcon), it is determined that no other TE&S species are known to exist within Pocket/Baker (164).

### PINYON-JUNIPER COMMUNITY

The pinyon-juniper occurs on the western most tip of the Pocket/Baker ecosystem on Nash Point (488 acres). Blue grama is the major understory species. Arizona white oak occurs in small patches within this vegetation type. The area is characterized by large mature junipers interspersed with young junipers invading the natural grassland openings. Prior to European settlement, pinyon-juniper woodlands were open, sparse, and savannah-like (Burkhardt and Tisdale 1976, Vasek and Thorne 1977, Miller and Rose 1994). Exclusion of fire, climate changes, and livestock grazing have been cited as causes for the increase in tree dominance in the pinyon-juniper community (Miller and others 1994). With increasing tree cover, forbs and shrubs decline at a much greater rates than do the perennial grasses (Tausch and West 1994).

Both wind and water erosion processes are integral (and historical) parts of the pinyon-juniper ecosystem (Baker and others 1994). There is a delicate balance between the erosional processes and the conditions required for adequate vegetative cover. This delicate balance makes the pinyon-juniper ecosystem particularly sensitive to disturbance from both natural and land management uses and abuses (Baker and others 1994). An imbalance leads to reduced vegetative cover and accelerated soil loss. The increase in tree cover has also been attributed to the loss of perennial streams (Ponce and Lindquist 1990).

Because young junipers (less than 50 years old) do not survive fire, most factors causing a reduction in fire frequency will increase the dominance of junipers. Therefore, manipulating the juniper overstory appears to be one way of altering understory production. The percent increase in understory herbaceous biomass following pinyon-juniper control on nine study areas in the southwest ranged from 33-2907 percent (Pieper 1994).

## LANDSCAPE PATCHES

### MOUNTAIN MEADOW

There are a few small meadows totalling less than 10 acres. There are a dozen or so wet meadow inclusions (1/4 acre or less) in other vegetation types. The dominant species in mountain meadows are Kentucky bluegrass and western wheatgrass. Dickenson Flat meadow was compacted by ungulate grazing and recreation foot and vehicle traffic. It was fenced in 1994 to exclude cattle and recreation traffic and the soil was ripped to increase water and nutrient cycling. Twenty-nine Mile Lake and Five Mile Lake are both seasonal wet meadows. Where water stands during the wet season, the area is heavily populated with sedges. The road into Five Mile Lake has been closed and ripped in an effort to exclude vehicle traffic. A new road has been constructed to maintain access outside the meadow. TES map unit 55 is mountain meadow supporting generally Kentucky bluegrass and Arizona fescue. Compaction and low ground cover has contributed to poor growth and species composition.

### ASPEN

Aspen predominantly occurs as remnant patches (18 occurrences) in the ecotone between the ponderosa pine and mixed conifer habitat types. The remainder occurs in the white fir habitat type. Within the Pocket/Baker ecosystem, all of the aspen populations appear to be declining, with dead or dying trees abundant. Aspen regeneration less than 15 years old is sparse to absent.

### MIXED CONIFER

Mixed conifer vegetation consists of white fire, Douglas-fir, ponderosa pine and Gambel oak. It occurs along pivot rock canyon, the rim, and the north slope of Baker Butte. There are 751 acres (identified through TES) of stands where mixed conifer species are the dominant species. There are 31 other occurrences of mixed conifer on 1639 acres, where the mixed conifer species occur as inclusions. The Pocket 10K TES mapping units do not indicate the presence of the mixed-conifer vegetative type. However, mixed-conifer inclusions exist within several sites. The inventory survey method used for the Pocket 10K did not record mixed-conifer inclusions, though they exist on cool canyon slopes.

#### *Red Squirrel Habitat*

Red squirrels depend on the mixed-conifer vegetation type to meet habitat requirements. Suitability of the habitat is dictated by the size, density, and grouping of coniferous trees. A grouping of multi-storied trees (12"+ dbh) with a high basal area (150-200 square feet per acres) provide a nest site, protective cover, a food source, and a shaded, moist site for cone storage. Usually included within the tree group is a large snag or down log which is used as a food caching site (Vahle and Patton 1983).

Squirrel feeding activity, on stored cones, around logs, snags, or large live trees, results in an accumulation of cone debris. These cone debris accumulations, or middens, become very large, and provide subsequent cone caching sites.

Observations of red squirrel middens indicated their presence within the Baker 10K. Of the 22 sites identified as mixed-conifer, 12 contained red squirrel middens. Five of the 31 sites with mixed-conifer inclusions were found to contain red squirrel middens.

## LANDSCAPE CORRIDORS

### ROADS

State highways 87 and 260, major north-south and east-west roads, traverse through the Pocket/Baker Pocket/Baker ecosystem, providing easy access for people from Phoenix and the Verde Valley. After all closures and obliterations from current Resource Access/Transportation Management (RATM) decisions are completed, there will be approximately 73 miles of open roads, 27 miles of closed roads, and 41 miles of roads obliterated. (The current RATM decisions do not reflect changes being proposed). The resulting road density is about 2 miles per square mile. Funding for road closures is sporadic; thus, there is no estimate on when the resulting road density will be reached as many of the roads proposed for closure or obliteration are currently open.

### TRAILS

Several trails provide hiking opportunities. The Pine Canyon Trail extends to the Tonto National Forest and begins just north of Baker Lake. Recreation planning studies show an opportunity to develop parking and trail access at this location for the Cinch Hook snowplay area (63). The General Crook Trail traverses both the Pocket and Baker areas and is planned for nomination as a National Historic Trail. The Turkey Springs Trail traverses Milk Ranch Point and is used frequently by scouting groups. The Donahue Trail, which also crosses Milk Ranch Point, runs toward the community of Pine.

## RIPARIAN

There are two stretches of riparian stream courses that occur in the Pocket/Baker Pocket/Baker ecosystem. One is an unmapped, unnamed stretch that is spring fed and goes subsurface in places. Located south of the 218/300 road junction, its riparian vegetation is limited to pockets of sedges. The other is in Horsetank draw. Its accessibility is very limited due to steep rock walls. The riparian vegetation consists of streamside shrubs and trees, but does not include willows.

## WILDLIFE TRAVELWAYS

Travel corridors provide an array of important habitat conditions for a number of wildlife species. The corridors provide covered travelways; and foraging, nesting, and roosting habitat for such species as the goshawk, spotted owl, turkey, and non-game migratory birds. These corridors also provide covered travelways; and foraging, bedding, and denning habitat for bears.

Sites have been designated for management as travel corridors within the Pocket/Baker ecosystem. Corridors were identified to form connection between Sandrock and Calf Pen Canyons; and to form a connection between Calf Pen and Strawberry Canyons with Pine Canyon. From the north end of Baker 10K, corridors link adjacent 10K areas with Pine Canyon and Webber Creek via Corduroy Wash, Hick & Duncan Canyon and Pivot Rock Canyon. Two corridors cross Milk Ranch Point to form a connection between Pine Canyon and Webber Creek.

Of the 5446 acres designated for wildlife corridors, 2480 acres (46%) meet conditions for hiding, thermal, or combination cover. Twenty-four (24) percent of the Pocket/Baker ecosystem's cover is within corridor sites.

# CHAPTER 4 - FLOWS

This chapter describes the existing condition in terms of:

- the flow phenomenon that influence the landscape.

## NATURAL INFLUENCES

### WATER

The Pocket/Baker ecosystem lies within four 5th Code watersheds, the West Clear Creek, East Clear Creek, East Verde River and Fossil Creek, respectively. A 5th code watershed is a mapped major drainage of generally 150-200 thousand acres.

The Pocket/Baker ecosystem area does have a number of intermittent springs (Wildcat, Huffer, Garden, Patton, Baker Springs and several unnamed springs). Baker, 29-Mile and Five-Mile Lakes are intermittent wetlands and contain riparian vegetation (primarily sedges).

Results of the Terrestrial Ecosystem Survey (TES) show that watershed condition is unsatisfactory in TES map units 53, 55, 493 and 494. Watershed condition is unsatisfactory on these soils due to poor ground cover (both vegetative and litter) and compaction due to past and present uses (grazing, dispersed recreation, etc).

The results of the TES also show that watershed condition is satisfactory in the remaining mapping units due to adequate effective ground cover. However, further ground truthing found site specific areas that do not have a satisfactory watershed condition, mainly due to roads located in filter strips and logging and subsequent machine piling of created slash. Appendix E displays the roads and locations of areas of unsatisfactory watershed condition outside of TES Map Units 53, 55, 493 and 494. There are 46 roads that have been noted with watershed concerns in one or more locations.

### AIR

The State of Arizona statutes divide jurisdiction over air pollution sources between the State and the counties. The State has exclusive jurisdiction over air pollution sources having potential total emissions of 75 or more tons per day, but defer some jurisdiction to the counties. National Forest lands ordinarily would come under county air control measures, but only Maricopa, Pinal, and Pima Counties currently have established air pollution control districts. Consequently, the State (Arizona Department of Environmental Quality, ADEQ) has complete jurisdiction over air quality monitoring in the Pocket/Baker area. The Forest Service operates under guidelines set forth in the State Implementation Plan (SIP) as required by the Clean Air Act 1970 (amended 1977, 1990).

Payson is currently listed as a non-attainment area, and the Mazatzal Wilderness is a Class I airshed. Non-attainment means that ambient air quality standards are currently not met and there are restrictions for the amount and type of smoke that may be introduced into the airshed. The designation of a Class 1 airshed also translates into smoke amount and timing. The communities of Pine, Strawberry and the Verde Valley are treated as sensitive areas, even though they are not currently listed as such.

The current particulate standards (PM-10) will be changed to PM-2.5 by 1997, limiting further the size of the particulates which may be introduced into the airshed. When this happens, the Verde Valley, Pine and Strawberry will probably be listed as non-attainment areas. This will have a tremendous impact on the prescribed fire program, since these areas normally experience the diurnal smoke flow down the canyons which leads smoke into the communities.

## FIRE

Compared to southwestern ponderosa pine, few ecosystems compare in the importance of fire for the maintenance of forest health and stability (Harrington and Sackett 1990). Fire's role within the ponderosa pine and pinyon-juniper ecosystems is to maintain vegetation species, age, and structure diversity, shrub and herbaceous vegetation production and nutritive value, nutrient cycling, wildlife diversity, and wildfires at low intensity. Problems resulting from exclusion of fire in ponderosa pine results in the simplification at all levels of the biotic and landscape hierarchy (Covington 1993).

### Fire Occurrence

Fire occurrence and potential are moderate to high for both natural and human caused ignition. Because of high recreation use, the potential for human caused fire is high. The numbers of fires the last few years has been low because of above average rain and snowfall. In drier years, enforcement of smoking and campfire restrictions has been successful in reducing the number of human caused fires. The 5 year average for human caused fires is 149 for 479 acres. Lightning fires average about 40 per year in the area and are usually 1/4 acre or less. The Bray Fire of 1990 is adjacent to the Baker 10K and burned some 500 acres.

There is some evidence of stand replacing fires in the area. Two examples of this are the southwest tip of Milk Ranch Point and the "Locust Grove" northeast of Baker Butte. The University of Arizona Tree Ring Lab studied a slab and several cores from the area. It appears there was a stand replacing fire in the draw and North side of Baker Butte approximately 100 years ago, that retarded the conifers so that the New Mexico locust could become established and grow unimpeded. The world record locust occurs in this area. During the Rim EA inventory, other trees were found that are believed to be bigger than the record tree. The occurrence of stand replacing fires is probably on about a 150 year rotation in the Pine type and 200-250 years in the mixed conifer type. A major factor contributing to this is the "chimney effect" influenced fire behavior from the Mogollon Rim Escarpment.

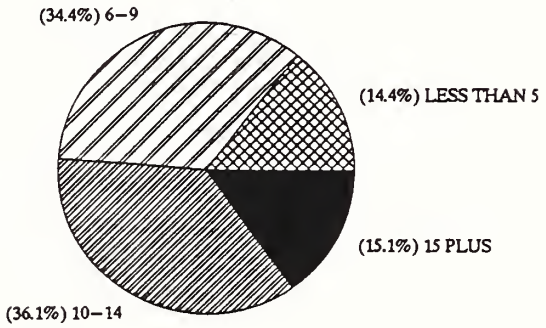
### Forest Litter Loads

The combination of heavy fuel loading and fire starts (lightning and human) are responsible for a dramatic increase in the number of acres burned since 1970. Between 1970 and 1990 seventy percent of the years since 1915 with a wildfire acreage total in excess of 100,000 acres occurred between 1970 and 1990 (Sackett and others 1993). With decomposition rates extremely slow and annual fuel accumulations from 0.6 to 3.5 tons per acre, forest fuel loads in excess of 20 tons per acre are common.

Figure 2 displays the downed woody fuel loading for the Pocket/Baker area. The fuel loading for a stand does not account for the volume of existing piles, which can increase the stand total considerably. Total fuel loadings are averages based on transects within a stand; isolated areas of higher loadings can occur within stands.

**Figure 2**

FOREST LITTER LOADINGS
TONS PER ACRE




## NEOTROPICAL MIGRATORY BIRDS

The information concerning neotropical migrant birds inhabiting ponderosa pine forests of the southwestern United States is very limited. Their historical population densities are not well documented, and little research has been conducted into their habitat preference, foraging patterns, and reproductive needs. Indeed, the issue of which birds actually are neotropical migrants is not yet resolved. There are some bird populations that belong to neotropical species, yet they reside or winter in Arizona.

A list of regularly occurring neotropical migrants on National Forests in Arizona lists only 31 species to occur on the Coconino National Forest. According to this report, between 1980 and 1989, the common nighthawk and Lucy's warbler are the only species in Arizona to show significant decreases in numbers from census data collected through the Breeding Bird survey. Numbers of brown-crested flycatchers, northern orioles, and turkey vultures have increased between 1966 and 1989. Specifically, higher elevations of the Mogollon Rim and other mountains in Arizona (pinyon-juniper up through spruce-fir forests) show decreases in the black-chinned hummingbird and western tanager between 1980-1989 and increases in blue grosbeaks and northern orioles from 1966-1989.

Low riparian areas have the highest overall use by all neotropical migrants of special concern as well as the highest use as primary habitat (habitat fidelity was not available for aspen). High riparian areas and aspen also are highly used (USDA 1996c). Riparian and aspen habitats are limited in the Pocket/Baker area.

Of the ninety neotropical migrants, nine are threatened, endangered or sensitive species. These include the Swainson's hawk, osprey, peregrine falcon, flammulated owl, southwestern willow flycatcher, belted kingfisher, burrowing owl, yellow-billed cuckoo and gray catbird.

The western tananger and flammulated owl are dependent on old growth (VSS6) ponderosa pine for feeding and cover. Current structural stage distribution in ponderosa pine is not well balanced and may be impacting some neotropical migrants (USDA 1996c). All of the species which have been decreasing are insect feeders. No information is available on whether insect populations are decreasing.

Approximately 55% of the neotropical migrant bird's that may be present on the Pocket/Baker 20K can be found in ponderosa pine habitat for foraging purposes, nesting sites, or both. Of those, about 30% are found in land that is open or in an early successional stage. However, many of these birds are habitat generalists that do not necessarily prefer ponderosa pine but are capable of exploiting it.

Due to the different guilds of neotropical migratory birds such as aerial feeders, pickers and gleaners, ground feeders, peckers, hammers and tearers, cavity and depression nesters, it appears that the quality, not the quantity, of trees is the key to promoting greater neotropical migratory birds species richness and density (Brawn and Balda 1987). The type of habitat that can best accommodate these guilds is one that has been "moderately thinned with a mixture of close canopy patches of pole timber and openings with dispersed yellow pines and a productive understory," (Brawn and Balda 1987) and well developed herbaceous ground cover. Similar findings have been reported by Szaro and Balda (1979).

Several papers illustrate the importance of stand composition on neotropical migratory birds' diversity. Szaro and Balda (1979) found that a higher number of species was found in ponderosa pine-oak habitats as opposed to habitats composed entirely of ponderosa pine. Rosenstock (1994), in his preliminary analysis, determined that the presence of aspen in pine-oak forests increased species diversity even further. Rosenstock detected twenty-two neotropical migratory birds species in the aspen-oak-pine stand including Williamson's sapsucker, Cordillieran flycatcher, and olive warbler which are somewhat rare in ponderosa pine habitats. He estimates that "avian abundance at (the aspen-oak-pine) site is 40-60% higher than in pine-oak stands" sampled in 1993. Among those found were the Warbling Vireo, Western Bluebird, and Williamson's Sapsucker. They depend heavily on aspen for nesting sites.

Although grazing and severe thinning have led to increases in forest edge neotropical migrant species such as the brown-headed cowbird, dusky flycatcher, chipping sparrow, and pine siskin, they have led to a decrease in more sensitive or already declining species such as the hermit thrush and Swainson's thrush (Evans and Finch 1993). The role that nest predation and cowbird parasitism plays in the decline of neotropical migrants, especially songbirds, becomes increasingly important as fragmentation of riparian, as well as other habitats, occurs.

## ELK/DEER

The 20K lies within the range of three subspecies of wild ungulates; the Rocky Mountain elk, the Rocky Mountain mule deer, and the Coues white-tailed deer (Severson and Medina 1983). Numerous observations of all three subspecies and their sign indicate the area's ability to provide sufficient amounts of forage, cover, and water to provide suitable habitat conditions. The entire 20K is considered to be primarily summer range, but does receive some limited use during mild winters. Spring and fall seasonal movements occur in and out of the 20K via the north and northwestern areas.

Elk and deer share the area's forage resource with livestock (cattle) which graze the Calf Pen and Baker Lake Allotments. Approximately 72% (16,400 acres) of the 20K is vegetated with native herbaceous plant species; where the grasses consist of bottlebrush squirreltail, blue grama, Arizona fescue, mountain muhly, junegrass, and muttongrass. As for forb species, the only ones listed in a 1983 range analysis for the Calf Pen Allotment are a vetch and a buckwheat. Additional forb species known to exist are mullein, dandelion, thistle, western yarrow, goldenrod, and golden pea. Approximately 28% (6,300 acres) of the 20K has been seeded with orchardgrass, smooth brome, and wheatgrasses. Introduced forb species included yellow blossom sweetclover and burnette. The predominate grasses of the small mountain meadows (33 acres) are Kentucky bluegrass and blue grama. Manzanita, turbinella oak, mountain mahogany, ceanothus, and cliffrose make-up the most dominate shrub species.

Although artificial waters (earthen stock tanks) have been created and placed to achieve more widespread distribution of the livestock, the waters have allowed elk (and to some extent, deer) to expand their range and population numbers. Not only have these waters increased and/or enhanced the use of otherwise unused habitats by wild ungulates, they have provided habitat for an array of other wildlife species (non-game and game birds and mammals (bats - Rabe 1995), and raptors (e.g. common black-hawk and accipiters).

# HUMAN INFLUENCES

## FIRE SUPPRESSION/FUELS MANAGEMENT

### Wildfire Suppression

Efforts to control fires along the Mogollon Rim began in the early 1900's with a full suppression strategy, meaning all fires were extinguished. Most often only one or two men would work on a fire because there were so few Forest Service employees available. The Baker Butte Lookout, at that time only a platform in a tree, was established in 1910. The tower was constructed about 1913. Baker Butte and Woody Mountain Lookouts were the first fire lookouts on the Coconino National Forest. Early suppression efforts and continued advances in fire suppression and forest management technology made suppression very effective. With fewer and fewer naturally occurring, cool burning fires to play the historic role of as the custodian of the forest, the face of the forest has changed dramatically over time. Slowly, with the additional impact of selective logging and grazing, the ponderosa pine forest changed from open, grass covered forest with large trees interspersed with patches of regeneration to the dense, often stagnate forest of small trees with little or no understory vegetation we see today.

After prescribed fire is established there will be more opportunities to utilize the appropriate suppression response strategy; confine/contain/control. This will allow fire to function in a more natural role. Confine/contain can be used on a limited basis now in open stands and where loadings are light. Its use is based on minimizing the cost of suppression and resource loss.

A cooperative effort for prescribed burning, and fire control strategies is being developed with the Tonto National Forest. This will allow fire to burn in its more natural pattern from the bottom or side of the Rim over the top. To lessen the threat from human caused fire, an aggressive education program is underway with the Tonto Forest in the communities of Pine and Strawberry. This includes the benefits of returning fire to the ecosystem, use of prescribed fire, fire prevention and appropriate suppression response.

This is an important program because of the development of houses in Pine Canyon. Currently, this area is the most serious threat of fire and could possibly result in loss of life as well as property.

### Forest Fuel Treatments

Within the Baker 10K, since 1980, at least 7500 acres, about 65%, have had fuel treatments of either pile burning, broadcast burning or both. Most of the broadcast burning is a result of creep from pile burning efforts. The Baker Butte burn of 1982 was a broadcast burn, that burned hotter than intended in some areas, but resulted in benefits like openings for stand diversity and increased snags. Though most of the machine piles were burned, there are currently an average of 1 to 2 machine piles per acre on 65% of the

area, ranging from 1/2 to 5 piles per acre. Handpiles occur over 25% of the Baker area. Many of the handpiled sites are along the Rim. The handpiles resulted from fuelbreaks and pulping operations. A large portion of handpiles that contributed to the spread of the Milk Fire in November 1992 were consumed.

Fuel treatments in the Pocket 10K resulted from harvest treatments in the Crook Timber Sale. Approximately 2100 acres were machine piled and burned.

## RECREATION

As more and better access to the Rim Road became available through timber sales, recreationists started to find the area in greater numbers each year. Cook (1980) stated that "In 1938 one would see an "outsider" once every two or three weeks on the Rim Road, now [1980] several thousand people travel that route each year.

The Mogollon Rim is a popular recreation destination for many visitors to the Pocket/Baker ecosystem. The area which extends east and west beyond the Pocket/Baker ecosystem attracts many forest visitors, because of access, beauty, and recreation opportunities.

### Visual Character

The visual character of the Pocket/Baker ecosystem is described by the landscape and design analysis (61) and the Recreation Opportunity Spectrum (ROS) classification. Geologic features that attract visitors are the canyons and escarpments that typify the rim country. There are numerous vistas from the edge of the Mogollon Rim on Milk Ranch Point and along highway 87 (though they are brief and not associated with vehicle pullouts). There are also several vistas along forest road 609 from which visitors can gaze into the Fossil Creek Wilderness. There are numerous tributary roads that lead to the edge (and usually a dispersed campsite) of both the Mogollon Rim and the Fossil Creek Wilderness.

Vegetative features (described in previous section) that are distinct are the remnant yellow pines, meadows, and various juxtapositions of vegetative groups and species. The changing colors in the leaves of aspen and maples attract visitors to the Baker Lookout area in the fall.

Along highways 87 and 260, the viewscape is dominated by dense, young pine, with a fair scattering of yellow pine, oak and alligator juniper, that result in a tunnel appearance (103). With the density of younger/smaller trees, clumps of yellow pines or old growth alligator juniper and Gambel oaks are often obscured for all but a brief instant giving the appearance that there is little variety. Mistletoe infections, understory competition, and fire exclusion will affect the sustainability of this dense viewscape (103). Crown indicators on most yellow pines show they are in declining health. Tree density is also shading and choking out many of the larger oak and juniper as indicated by dying crowns and lack of regeneration. The Arizona Department of Transportation (ADOT) has identified 6.7 miles of dangerous situations for vehicle traffic along highway 87 due to impairment of sight distance and shading that retards snowmelt (ices roads) (102).

The Pocket area has ROS classifications of semiprimitive motorized (SPM), roaded natural (RNA), and primitive (wilderness that lies within the 10K). The Baker area is all roaded natural (73). Semiprimitive classification is characterized by rough, mostly four-wheel drive roads where overstory vegetation has an appearance of many ages and sizes without overwhelming evidence of timber harvest activities.

Most of this type occurs in the northwest quadrant of the Pocket area and the points extending to the west. Roaded natural, by contrast, has roads easily travelled and readily exhibits evidence of timber harvest activities.

## Recreation Opportunities

During the summer months visitors are attracted by scenic views into the Fossil Springs Wilderness area, excellent opportunities to view abundant wildlife, a variety of roads for the OHV enthusiast, picking wild raspberries, a place to gather with friends for the weekend, and a feeling of peace and solitude. Most summer visitors return to this area annually, staying an average of 2-3 nights. Nearly 90% of the visitors camp where vehicle access is good.

From late October to mid-December the majority of the visitors are hunters. The Pocket/Baker Pocket/Baker ecosystem is located within wildlife management units 5A and 6A. Hunters prefer good road access over solitude fearing being trapped in inclement weather (73).

Winter uses currently recognized in the Pocket/Baker area are cross country skiing, snow tubing, and general snowplay activity. Several cross country ski routes have been identified, snowplay is well established at Cinch Hook rock pit attracting over 200 visitors per weekend, and general snowplay is available because good snow is usually found. The snowplay area has had a steady increase in visitors since the early 1980's (127). A number of safety concerns and the lack of a concessionaire forced the closure of Cinch Hook in 1994-95. Safety hazards associated with the snowplay area include illegal parking along the shoulders of highways 87 and 260 due to the lack of adequate parking; U-turns in the highways especially during inclement weather or icy conditions; pedestrian traffic along the highway with narrow shoulders (especially when snow has been plowed); and vehicles turning on and off the highways from hazardous side roads (unplowed, slippery, poor visibility with snow creating poor traction) (127).

Other problems identified as a result of increasing recreation in the Pocket/Baker Pocket/Baker ecosystem are the number of unlicensed juveniles riding ATV's; unsafe shooting particularly in the Potato Lake area; and an increase in the occurrence of litter and vandalism particularly in the Baker Lookout area (128).

Local and statewide off highway vehicle (OHV) groups use several sets of roads within the Pocket/Baker for routes that provide a loop experience (91). The main areas are Milk Ranch Point and the various tributary roads; roads in the Potato Lake area (FR 147); forest road 609 in the 87/260 junction area; and forest road 608, which traverses from the community of Strawberry up the rim and eventually ends at highway 87. The 608 road is of particular interest to local OHV clubs. The road was constructed in the early 1900's as a main road between Payson and Camp Verde. Its cultural aspects (rock drainage structures), difficulty (caused by erosion), and audio-visual amenities makes this a popular road for local and statewide OHV clubs (125). The road was closed (temporary) in 1994 and will remain so until concerns for safety and cultural integrity of the drainage structures, which are being damaged by vehicle traffic, and erosion caused by lack of road maintenance (125) are resolved. None of the roads are used extensively, but the OHV groups continue to use them year after year (91).

There is an electronic site at 5 Mile Lake under special use permit.

## LOGGING

The "new" Rim Road was completed across the south end of the Coconino National Forest in 1938. Even with the improved road condition, about the only users in the area were sheepmen and Forest Service employees, and a few hunters in the late fall months. "Accessibility to the Rim Road was another matter - from any given point on the Rim Road ... it was a long way to anywhere" (Cook 1980). The general isolation and inaccessibility of the Mogollon Rim prevented large-scale logging in the Pocket/Baker ecosystem area until approximately 1948. A few salvage operations did occur along the Rim in the early 1940's, notably a salvage of approximately 2 million board feet on Miller and Blazed Ridges and a "mortality anticipation cut" on Battle Ground Ridge. In both cases a saw mill was set up at the harvest site and roads were improved that opened access to the Rim Road.

In 1948, another connecting link to the Rim Road was made to access a timber sale at Moqui Ranch and the site of the present-day Blue Ridge Ranger Station. At about the same time surveys were started for a road system to log 250-300 million board feet of pine in the Rim area south of Clear Creek (Cook 1980). With these new roads came more people interested in the area and better access to forest resources along the Mogollon Rim.

The Timber Management Plan for the Flagstaff Federal Sustained Yield Unit of the Coconino National Forest (1953) indicated that the West Clear Creek block (of which Pocket/Baker was a part) are "virgin except for removals which have been made under the mortality anticipation harvesting program" (p. 5). It was expected that the logging camp at Happy Jack is "fairly well located with reference to the Blocks (West Clear Creek and General Springs (*clarification added*)) which are expected to form the operating area for the large mills during at least the next two cutting cycles" (p. 8). The plan projected a 10-year harvest of trees subject to immediate mortality, followed by a harvest in the next 10 years called an intermediate improvement cut. Though actual harvest records are poor for the West Clear Creek block, projections for 1973-1983 indicated that about 16 million board feet per year were harvested on about 5,000 acres per year (Timber Management Plan, June 1973).

The most recent logging activity (since 1980) on the Pocket/Baker area were from the Crook, Baker, D&H, and Forty-four Timber Sales. The Crook Timber Sale (about 20 MMBF) covered approximately 2100 acres in the eastern compartments of the Pocket. The prescription was generally a removal of pine trees over 16 inches in diameter. The Baker (about 25 MMBF), D&H (about 4 MMBF), and Forty-four (about 7 MMBF) Timber Sales were located on about 9600 acres of the Baker 10K. Many of the cuts removed yellow pines, but failed to address the mistletoed understory. Consequently, much of Milk Ranch Point is a residual stand of trees less than 18 inches in diameter with moderate to heavy mistletoe infection.

The Forest Plan (1987) has designated MA-3 (57% of Pocket/Baker) for timber production in association with other uses. The Forty-four and DH Timber Sales are the only two sales implemented since the inception of the Forest Plan.

## LIVESTOCK GRAZING

Livestock grazing began in northern Arizona in the mid 1860's when livestock were brought in to supply food to Fort Lincoln in the Verde Valley, Flagstaff and surrounding settlements. The main influx of cattle occurred during the late 1870's and early 1880's, with the most important stimulus to the northern Arizona cattle industry being the completion of the Atlantic and Pacific Railroad to Flagstaff in the early 1880's (Schlegal 1992). Federal Census records of the time show livestock in Arizona increased from

5,132 head in 1870 to 721,000 head in 1890 (Federal Census 1860-1890), though these numbers are likely low because many ranchers failed to report the exact numbers for tax reasons. However, these numbers do show the dramatic increase in livestock use during that time.

Records show heavy grazing and overstocking probably existed in the Calf Pen area during this same period as the first settlers arrived in Pine and Strawberry (Tatschl 1971a, 1971b). Indeed, according to old-timers, there were already large numbers of cattle in the area when the first settlers arrived. The 1870 General Land Office survey reports also describe large herds of cattle, sheep and some horses grazing in the summer months in the area (White 1879). Livestock were moved up to cooler climate of the Calf Pen/Baker Lake area from both the Verde Valley and from the Pine and Strawberry region in the summer months as these communities developed.

Overuse and mismanagement of the range following the introduction of livestock produced profound changes in the plant cover. Plummer (1904) notes that forage grasses were abundant throughout the Black Mesa Forest Preserve, but "the best growths are always found at some distance from water...As perpetual water is approached the effect of grazing is seen by the gradual, and finally total disappearance of the grasses." Under heavy grazing the original tall bunchgrasses were largely replaced by plants more resistant to grazing, except where dense tree cover discouraged grass production and, therefore, livestock use. In the early days of heavy grazing, livestock use was also cited as the primary cause of the over abundance of young pines (Cooper 1960). As the grass cover is overgrazed and no longer outcompetes pine regeneration for soil, nutrients, and water, pine reproduction becomes established in greater areas. Grazing also contributed to the reduction in fire occurrence as heavy grazing removed inflammable grasses (Cooper 1960).

Livestock grazing in northern Arizona went unrestricted for many years and the area became overstocked by the early 1890's (Schlegal 1992). In 1898, President McKinley set aside the San Francisco Mountain Forest Reserve in northern Arizona and, on January 1, 1906, grazing fees were collected for the first time in this area. The "open range" policy was now restricted and range management became an emphasized duty of the early Forest Service rangers (Lightbourn and Lyons 1989).

### Grazing in the Baker Lake/Calf Pen Allotments

In the early 1910's, the Baker Lake/Calf Pen allotment area became part of the Pine Community Allotment, which included the northwest portion of the Payson District of the Tonto National Forest and the current Baker Lake/Calf Pen area of the Long Valley District of the Coconino National Forest. The allotment was administered by the Tonto National Forest. Although, the Pine Community Allotment was now considered a "managed" area, the land was still overstocked. Stocking probably reached a peak on this allotment area about 1920 when there were 25 permittees and a total obligation of 3767 head yearlong. By 1942 the number of permitted livestock was reduced to 962 head yearlong, or about one-fourth of the number permitted in 1920.

In 1942, the Pine Community Allotment was divided into three smaller allotments; Skeleton Ridge Allotment, Deadman Mesa Allotment, and the Pine Community Allotment. The division split the Mogollon Rim, or Baker Lake/Calf Pen, portion of the allotment area into approximately the same allotment configuration as exists today. The new Pine Community Allotment included what is now the Baker Lake area and the Deadman Mesa Allotment included the Calf Pen area. At this time the rangeland was seriously overgrazed and in poor condition, especially in the vicinity of Buckhead Mesa, Hardscrabble Mesa and Cave Springs (all on the Tonto National Forest). There were no control fences

and, because water was limited, livestock use was not well distributed. Cattle use was concentrated in meadows and around the few water sources.

The newly configured Pine Community Allotment had a preference of 881 cattle yearlong in 1942. A range protection reduction became effective in 1945 that reduced the total preference to 663 cattle yearlong; a non-use agreement became effective that same year, reducing the permitted numbers on the Pine Community Allotment area to 353 cattle yearlong. However, the non-use agreement was not strictly adhered to and the actual use varied from year to year. The reductions in livestock numbers did result in an upward trend in range conditions.

In 1947, a trespass and transfer reduction further lowered the total preference number of the Pine Community Allotment to 539 cattle yearlong. Additional trespass and transfer reduction lowered the total preference number to 324 cattle yearlong by 1950; the numbers remained at this level until 1958 when the Cedar Bench Allotment was fenced off from the Pine Community Allotment. The actual use from 1958 to 1960 on the Pine Community allotment was 326 cattle yearlong and 241 cattle for 5 months.

A.M. Lufkin and Charles Peach were the permitted users of the Deadman Mesa Allotment in 1942, with a total preference of 297 cattle yearlong. In 1946, a protection reduction was made on the allotment, and Peach waived his small preference to Lufkin. Permitted numbers were again reduced in 1949 due to trespass, from 221 head to 175 head yearlong.

The Pine Community Allotment area was divided again after a 1960 allotment analysis. A small portion of the west end became part of the Cedar Bench Allotment, and the remaining area was divided into the Hardscrabble and Pine Allotments. This most recent allotment division left the Pine Allotment, including the Baker Lake area, with an actual use of 74 cattle yearlong. Actual use ranged from 69 to 80 head each year from 1960 to 1970.

In 1970, the Coconino National Forest began administering the portions of the Pine and Deadman Mesa Allotments above the Mogollon Rim and use was limited to every other year. These allotments were renamed the Baker Lake and Calf Pen Allotments, respectively. Wendall and Peggy Randall acquired the Baker Lake allotment permit which allowed 78 cattle and two horse to graze the area every other year; the Cinch Hook pasture was transferred to the Baker Lake Allotment in 1987. The grazing permit was reissued to the Randalls in 1989 for 84 cattle and 2 horses from June 1 to October 31 every other year. The Randalls still hold the grazing permit for the Baker Lake Allotment; the current permit expires December 31, 1999.

Lufkin Hunt held the permit for the Calf Pen Allotment area in 1970 when administration of the area transferred to the Coconino National Forest; the permitted use was reduced to 65 cattle in 1974 because of overstocking concerns. In 1980, the Double Spur Ranches acquired the grazing permit for the allotment area. The graze season was lengthened from June 15 through September 30 to June 1 through October 20 in 1983, and the permitted numbers were reduced to 47 head in 1987. Wendall and Peggy Randall acquired the grazing permit on the Calf Pen Allotment in 1989; the current permit expires December 31, 1999.

Range condition trend from the 1940's to 1970's is described generally as static with little forage available (Tatschl 1971a&b). In this report Tatschl reported only scattered remnants of Arizona fescue and muttongrass.

In 1942, when the Baker Lake and Calf Pen areas were divided into parts of separate allotments, graze periods did not change. In 1960, the Baker Lake portion was split into two pastures, giving the Milk

Ranch Point pasture a two month graze period and Baker Lake pasture a three month graze period from June 1 to October 31. Starting in 1970, use was limited to every other year. This two-pasture deferred-rotation system is the range management still in place today. In 1974, the Calf Pen portion of this area was split into two pastures, giving the North and South pastures each a 2.5 month graze period. The range management system currently used on the allotment is a four pasture deferred-rotation system put in place in 1980. This system was put in place in 1984 and uses graze periods of 1.25 months in the Pocket Unit, 1.75 months in the 29 Mile Unit, 1.25 months in the 7 Mile Unit and .5 months in the Brush Unit from June 1 to October 31.

The two clusters established in 1970 and reread in 1983/1984 show specific recent range condition trend (Kerns 1983 and 1984). The trend has been static except for a decrease in litter, most likely from the piling operation.

Away from the mechanically piled and seeded areas range conditions have generally remained static since the 1970's. Areas under B and C tree canopies have shown the biggest decline because of the heavy needlecast layer that limit forage production.

Elk overgrazing was not an issue in this area until the mid-1970's when it was first recorded in range inspections. Elk overgrazing is mainly limited to seeded areas, meadows and areas around earthen tanks and springs. This use has been recorded in these some of these areas to be greater than 60% from May to October. This use has most likely limited forage production and ground cover in these areas.

## Current Situation

The Pocket/Baker area is currently grazed with livestock under permit to Wendell A. and Peggy May Randall. The Baker Lake allotment (two pastures) provides for 84 cattle and 2 horses from June 1 to October 31 every even-numbered year. The Calf Pen allotment (three pastures) provides for 47 cattle from June 1 to October 31 every year. These allotments are a portion of the summer range for the Pine and Hog Canyon allotments of the Tonto National Forest. The current allotment management plan was approved in 1984. There are currently 32.5 miles of fence, 41 earthen water tanks, and 7 cattleguards associated with the pastures of both allotments. There has been no mechanical treatments of the pinyon-juniper on either Nash or Pocket Points.

Because the existing pastures are very large, there is very little control over livestock use. Livestock tend to graze selectively in both location and type of vegetation, and leave areas both under- and over-utilized. Cosby (1978) and Stoddart and others (1975) wrote that livestock exclosures reduced forage production and range condition. They felt that not removing the decadent forage material from a plant would choke the plant out, reducing its production. Under-used plants shaded out by their own leaves eventually cannot photosynthesize to produce the nutrients needed for growth and vigor (Savory and Parsons 1980, USDA 1987-1994, USDA 1989). In absence of fire to burn away the decadent material, an under-utilized plant declines in vigor. Over-use results in the plant's inability to grow, and photosynthesize adequately, and produce stores for future growth and reproduction. The result of both over- and under-utilization is a reduction in the amount of organic material which results in the decline of soil productivity. Concentrated livestock use is resulting in 50% of the area being overgrazed and 40% of the area being under-used (61).

## Cool/Warm Season Grasses

Understory species in terms of available forage is summarized in Table 10. Approximately 2/3 of the grasses are cool season. A cool season grass is green during the spring and fall while the warm season grasses are green during the summer months. In the pine type, cool season grasses are green from the spring through the fall because of the cool summer temperatures. Past grazing practices have resulted in heavier grazing on warm season species, thus reducing the species diversity and vigor with a greater impact than on cool season species. The balance of warm and cool season grasses is an important consideration for wildlife species in general. Elk prefer cool season grasses. Introduced species, the majority on almost a third of the Pocket/Baker area are more palatable to elk and cattle.

TABLE 10: UNDERSTORY DISTRIBUTION BY GROUPS

| Group | Percent of Area | Type |
|---|---|---|
| Pine Bunchgrass | 17% | warm season |
| Mountain Meadow | <1% | warm season |
| Introduced Species | 27% | cool season |
| Non-bunchgrass Natives | 49% | mostly cool season |
| Warm Season Species | 5% | warm season |
| Shrubland | 2% | -- |

Most of this area was logged in the 1960's through the 1980's. After logging was completed the ground disturbed areas (skid trails, temporary roads, piling areas and landings) were seeded with orchard grass, smooth brome, wheatgrasses and clovers to reduce erosion and to provide palatable forage. This seeded area now represents approximately 27% of the analysis area (introduced species).

To reduce the risk of wildfires in many logging areas, logging slash was mechanically piled and burned. In many of these piling areas ground cover was reduced by removing litter, plants and some topsoil. The range cluster data shows this change to ground cover by piling (Kerns 1983 and 1984). In fact, the clusters since 1984 have been accidentally removed by this piling effort.

# CHAPTER 5 - LANDSCAPE INTERACTIONS

This chapter describes the existing condition in terms of:

- the most influencing interactions between ecosystem functions and major flow phenomena as described by studies, scientific literature, and observations within and adjacent to Pocket/Baker.

## SOIL/WATER INTERACTIONS

### Soil and Plant Composition

Plant composition is the function of soil productivity, which is largely dependent on inherent soil quality and disturbances such as drought and soil disturbing management activities. Edaphic influences (physical, chemical, and biological) on soil productivity are generally related to soil properties such as the relative amounts of sand, silt, clay particles, soil depth, soil rock and climate; cohesion between soil particles (soil strength); air and water infiltration; chemical composition; degree of acidity of alkalinity (determines rates of reaction of chemical elements such as potassium, nitrogen, and phosphorus); and the presence of decomposers such as bacteria, algae, and fungi. Factors related to productivity decline include compaction, erosion, and burning (Hart and Hart 1993).

### Soil and Compaction

Soil productivity can be affected by compaction. Compaction is reduced porosity and increased bulk density which reduces infiltration which, in turn, leads to surface runoff and increased erosion potential, and decreased soil productivity. Soils with greater quantities of organic matter, soils that are dry , and soils with a large component of fine or coarse sands withstand compactive forces (Hart and Hart, 1993). Consequently, clay and sandy clay soils can be easily compacted, while loams with a wide range of particle sizes are also more easily compressed. TES map unit 53 (meadow) is a clay loam and observations at Dickenson Flat indicate that compaction has occurred from a combination of ungulate grazing and recreation. TES map units 546, 549, 550, 567, and 651 are fine sandy loams and are not easily, if at all, compactible.

The rest of the TES map units are loams and subject to some compaction from vehicles, grazing animals, people, and timber harvest equipment. These soils contain montmorillonites clay mineral which expand when wet and shrink when dry. This shrink-swell property allows the soils to recover from compaction more quickly (Pritchett and Fisher 1987). Except for well-used recreation sites, roads, trails, and landings, compaction in all TES units except meadows appears to be minor.

### Soil and Erosion

Soil productivity can be affected by erosion. Soil erosion can be defined as detachment, transport and deposition of soil particles. Soil erosion is a natural phenomenon, however, when soil erosion exceeds natural limits it becomes accelerated erosion. Erosion effects productivity primarily through the modification of various soil properties (Frye and others 1982). Chief among these soil properties is the removal of surface organic matter, which results in reduced plant available soil water and nutrients (Williams 1981). Control of erosion can best be achieved by maintaining and improving vegetative

cover, especially at ground level and maintaining relatively high infiltration rates through retention of surface organic matter (Hart and Hart 1993).

### Soil and Fire

High intensity, long duration wildfires or prescribed fires can be very detrimental to soil. At temperatures above 590 F for surface burns and 1200 F for pile burns, soil is sterilized and nutrients and microorganisms are destroyed.

### Water and Roads

The location of roads in stream course filter strips and stream channels alters the flow of water increasing the amount of sediment in the water and accelerating erosion.

## ASPEN INTERACTIONS

### Aspen and Fire

Quaking aspen is a successional community after fire which has been responsible over the last 150 years for the aspen stands that exist throughout much of the west (Severson and Rinne 1990). If aspen forests are to be sustained, use of prescribed fire is recommended. Only 7% of the estimated 470,000 acres of aspen in Arizona and New Mexico is in the seedling/sapling stage; the rest are mature or overmature (Patton and Jones 1977). Without management intervention seral aspen stands will probably be lost to conifers (DeByle and others 1987).

A review of several papers indicates that higher intensity fires may be necessary to stimulate adequate sprouting. Aspen responds best to moderate to high intensity fire where all aspens are top killed; forest floor is reduced to ash, and mineral soil is exposed (Severson and Rinne 1990). Where conifers are codominant, there is a high flammability hazard which can be mitigated by harvesting large conifers and leaving slash and smaller conifers.

### Aspen and Wildlife

Aspen stands are an important wildlife habitat component. Herbaceous understory is more productive and diverse; they are the only deciduous trees at higher elevations highly contributing to edge effect; and aspen itself is palatable and nutritious browse for elk, deer, and cattle. DeByle (1985) found 56 mammals and 77 birds in western aspen stands. Throughout the range of aspen, moist sites and aspen/conifer mixes have higher wildlife species diversity than pure aspen stands (Salt 1957, DeByle 1985, and Winternitz 1980).

### Aspen and Ungulates

Mueggler and Bartos (1977) state that without ungulate control, treatments on less than 12 acres is futile. Severson and Rinne (1990) recommend treating 15-25 acre blocks over a general area to distribute ungulates. These size blocks are also recommended to generate enough heat to achieve 90 to 95% kill of aspen to encourage suckering (personal communication, Karen Peck). Sheppard and Rolf (unpublished) had success in regenerating aspen on the Coconino and Kaibab National Forests with only ground disturbance (ripping) and fencing, but no fire stimulation. In a rehabilitation attempt of an isolated declining aspen clone, they achieved tremendous success by removal of the conifer stems and by then fencing the site.

## WILDLIFE INTERACTIONS

### Wildlife (General) and Vegetative Structure

In comparison with other habitat types within the ecosystem management area, the ponderosa pine matrix has the highest use by all Coconino species, as well as the highest use by dependent species, indicator species, and neotropical migrants. Of the 435 species which can occur on the Coconino National Forest, 50% of them use the ponderosa pine to meet some or all of their needs (USDA 1996c) (see Table 11). Mammals, reptiles and amphibians are mainly year round users, but the majority of birds use it as fringe or transient habitat and as summer habitat.

The ponderosa pine matrix also has the highest summer use by all Coconino species and moderate to high winter use compared to other habitats in the analysis area, making thermal cover important to wildlife for dealing with summer heat and winter cold.

**Table 11:**
**COCONINO SPECIES WILDLIFE HABITAT USE**

| | PP | HR | LR | DS | CH | MG | DG | PJ | MC | AS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Percent Use | | | | | |
| Total species overall use | **50%** | 40% | 47% | 32% | 12% | 34% | 30% | 49% | 20% | 37% |
| Birds | 46% | 49% | **61%** | 22% | 7% | 36% | 21% | 41% | 46% | 43% |
| Mammals | 56% | 18% | 12% | 46% | 13% | 41% | 29% | **64%** | 54% | 36% |
| Reptiles | 61% | 27% | 9% | 77% | 41% | 16% | 77% | **80%** | 39% | 9% |
| Amphibians | 54% | 38% | 46% | 31% | 15% | 23% | **69%** | 54% | 31% | 23% |
| Year Round Use | 18% | 6% | 7% | 20% | 10% | ? | 22% | **24%** | 17% | ? |
| Summer Use | **13%** | 4% | 3% | 3% | 1% | ? | 3% | 11% | 11% | ? |
| Winter Use | 2% | 0% | 2% | **4%** | 1% | ? | 2% | .4% | 1% | ? |
| Fringe/Transient | 17% | 30% | **38%** | 5% | .5% | ? | 13% | 13% | 17% | ? |
| Movement | 32% | 34% | **40%** | 12% | 2% | ? | 8% | 25% | 29% | ? |
| | | | | | Number of Species Use | | | | | |
| Neotropical migrants | **58** | 44 | 56 | 22 | 3 | 36 | 16 | 47 | 48 | 57 |
| TES Wildlife | 18 | 25 | **27** | 9 | 2 | 12 | 5 | 18 | 15 | 19 |
| TES Plants | 3 | 1 | 2 | **6** | 0 | 0 | 0 | 4 | 2 | 0 |
| Forest Indicator Species | **8** | 3 | 3 | 0 | 0 | 2 | 0 | 6 | **8** | 6 |
| Dependent Species | **12** | 1 | 3 | 5 | 6 | 0 | 2 | 0 | 3 | ? |
| Narrow Tolerance | 7 | 8 | **13** | 1 | 6 | ? | 3 | 8 | 2 | 8 |

Note - MG includes Mountain Grasslands, Dry Meadows, and Wet Meadows;

PP=ponderosa pine matrix; HR=high elevation riparian; LR=low elevation riparian; DS=desert scrub; CH=chapparal; DG=desert grasslands; PJ=pinyon-juniper; MC=mixed conifer; AS=aspen. (Boldface=highest value).

## Habitat by Structural Stage

Overall structural stage use by species in the ponderosa pine matrix appears to be evenly distributed with an emphasis on mature and old growth stages and dense ("C" canopy) covers. Table 12 indicates the overall species use by vegetative stand structure classes. Current conditions indicate that VSS distribution is unevenly distributed, with young to middle-aged forest conditions and open canopies dominating the landscape. Limited habitat availability in mature and old growth stages is probably negatively impacting TE&S species, indicator species, dependent species and birds (USDA 1996c). Most of the species dependent on old growth ponderosa pine are neotropical migrants. The northern goshawk is also dependent on this stage and it is highly used for feeding and cover by the Mexican spotted owl.

**Table 12:**

**OVERALL SPECIES USE BY VSS IN THE PONDEROSA PINE MATRIX**

| | |
|---|---|
| VSS 1 | 11% |
| VSS 2 | 11% |
| VSS 3 | 10% |
| VSS 4 | 12% |
| VSS 5 | 14% |
| VSS 6 | 14% |

Associated within each structural stage are numerous other wildlife habitat components that are inherently different given the particular site and past management conditions. These components include downed logs, presence of other vegetative species (see TES existing condition descriptions), rock outcrops, proximity to water, herbaceous coverage, and presence of dwarf mistletoe.

VSS1 has the highest use value for amphibians (from limited information), VSS1 and 2 have the highest use value for mammals, and VSS6 or old growth has the highest use value for birds. No reptiles are listed as high users of any structural stage, but this is due to lack of information on structural stage use. Old growth provides high use habitat for the most TE&S species and for the most species that use ponderosa pine. VSS4 and 5 provide high use habitat for the greatest number of indicator species. Overall species use, regardless of whether the use is low, moderate, or high is greatest in mature and old growth forest (USDA 1996c).

TE&S species and dependent species prefer the denser canopies (40%+), and indicator species prefer 60%+ canopy covers. VSS3 and VSS4 stages as well as "A" canopy covers have the lowest use by all life forms as well as species of concern, yet make up the majority of the ponderosa pine matrix. The VSS6 stage and "C" canopies in all stages have the highest overall use , yet make up the smallest part of the matrix.

Eighteen threatened, endangered, or sensitive animals, three TE&S plants, and 58 neotropical migratory birds use the ponderosa pine habitat. Some other species of special concern are those which are dependent on particular structural stages of ponderosa pine for their survival. The ponderosa pine has the highest use by neotropical migrants as well as the highest number of dependent species of all the habitats in the analysis area.

Twelve species are dependent on certain structural stages of ponderosa pine. The Arizona tiger salamander is dependent on VSS1, the Abert squirrel on VSS5 with a 40-60% canopy cover, and the Grace's warbler, red-faced warbler, white-breasted nuthatch, violet-green swallow, western tananger, mountain chickadee, northern goshawk, flammulated owl, black-headed grosbeak, and hermit thrush are dependent on old growth or VSS6 (Hoover and Wills 1984).

**Table 13:**
**THREATENED, ENDANGERED, OR SENSITIVE SPECIES AND THEIR FIDELITY TO PONDEROSA PINE MATRIX**

| Species | Fidelity |
|---|---|
| Northern Leopard frog | year round |
| Narrow headed garter snake | year round |
| Northern Goshawk | year round |
| Mexican spotted owl | year round |
| Small-footed myotis | year round |
| Southwestern toad | year round |
| Bald eagle | winter |
| Ferruginous hawk | winter |
| Pine Grosbeak | winter |
| Flammulated owl | summer |
| Gray catbird | summer |
| Peregrine falcon | summer |
| Fringed myotis | summer |
| Long-eared myotis | summer |
| Long-legged myotis | summer |
| Townsend's big-eared bat | summer |
| Swainson's hawk | transient |
| Allen's lappet-browed bat | transient |

Three TE&S plants can occur in the ponderosa pine matrix. They are the Arizona leatherflower, Arizona cinquefoil, and Tusayan flame flower (USDA 1996c).

### Wildlife (Mexican Spotted Owl) and Vegetative Structure

Despite the fact that southwestern landscapes are variable, nesting and roosting features are consistent. This strongly suggests that the Mexican spotted owl is selecting for particular nesting/roosting habitat characteristics (USDI 1995).

Current data is limited on habitat use by Mexican spotted owls at the stand scale though analysis of some data suggests that owls typically nest in relatively dense stands with high tree basal area (60%+ canopy closure also designated in VSS system as "C" canopy), a wide range of tree sizes (suggesting uneven-age structure) and a large tree component (Skaggs and Raitt 1988, Ganey and Balda 1989 and 1994, McDonald and others 1991). Q-factors (used to describe the relative shape of the diameter distribution) typically averaged less than 1.4.

SWCA (1992) concluded that owls selected nest sites based primarily on the availability of a suitable nest tree. Hardwood snag basal area and canopy cover were also important. Nest sites were more likely found on north or east aspects (Zhou 1994). Based on analysis of inventory and monitoring data collected since 1990, nearly 87% of all nest sites within the Upper Gila Recovery Unit were found in mixed-conifer vegetation type (USDI 1995). Nest trees are typically large in size (SWCA 1992,

Fletcher and Hollis 1994). Douglas-fir trees appear to be favored (SWCA 1992, Fletcher and Hollis 1994), while Gambel oak and white fir also provided significant nest sites (SWCA 1992, Armstrong and others 1994, Fletcher and Hollis 1994).

The primary use by owls for roosting sites occurred in mixed conifer vegetation with some use in unlogged ponderosa pine forest (Ganey and Balda 1994). Very little roosting occurred in logged stands.

Generalizations about habitat patterns used for foraging is difficult, particularly due to the lack of data (USDI 1995). However, one study by Ganey and Balda (1994) indicated higher use in unlogged forest conditions. The variety of prey eaten suggests that owls forage in a variety of habitats indicating that the owl is less definitive about foraging habitat than nest/roost habitat (USDI 1995).

Typical diets for owls within the Pocket/Baker ecosystem consists of small, nocturnal, terrestrial mammals such as Mexican woodrats, brush and deer mice. The deer mouse occurs throughout the pine-oak vegetation type and showed little population variation according to forest structure and composition (USDI 1995). The Mexican woodrat and brush mouse abundance, however, was related to understory characteristics, specifically log volume and shrub cover. In addition, Gambel oak presence was higher than randomly found in the forest (USDI 1995).

Appropriate foraging habitat must be provided to maintain a food supply. Conserving appropriate habitat for the owl includes conserving habitat for a range of prey species. Removal of mast producing trees such as oak, pinyon and juniper reduces prey food availability. Effects of tree biomass removal are largely unknown. Stands regenerated with even-aged shelterwoods will alter prey species habitat and may not provide appropriate foraging habitat due to effects on prey base community structure. Effects of tree removal on prey habitat lacks conclusive research; therefore, effects on prey habitat and populations must be based on speculation and conjecture (USDI 1995).

### Wildlife (Neotropical Migratory Birds) and Vegetative Structure

Due to the different guilds of neotropical migratory birds such as aerial feeders, pickers and gleaners, ground feeders, peckers, hammers and tearers, cavity and depression nesters, it appears that the quality, not the quantity, of trees is the key to promoting greater neotropical migratory birds species richness and density (Brawn and Balda 1987). The type of habitat that can best accommodate these guilds is one that has been "moderately thinned with a mixture of close canopy patches of pole timber and openings with dispersed yellow pines and a productive understory," (Brawn and Balda 1987) and well developed herbaceous ground cover. Similar findings have been reported by Szaro and Balda (1979).

Several papers illustrate the importance of stand composition on neotropical migratory birds' diversity. Szaro and Balda (1979) found that a higher number of species was found in ponderosa pine-oak habitats as opposed to habitats composed entirely of ponderosa pine. Rosenstock (1993), in his preliminary analysis, determined that the presence of aspen in pine-oak forests increased species diversity even further. Rosenstock detected twenty-two neotropical migratory birds species in the aspen-oak-pine stand including Williamson's sapsucker, Cordillieran flycatcher, and olive warbler which are somewhat rare in ponderosa pine habitats. He estimates that "avian abundance at (the aspen-oak-pine) site is 40-60% higher than in pine-oak stands" sampled in 1993. Among those found were the Warbling Vireo, Western Bluebird, and Williamson's Sapsucker. They depend heavily on aspen for nesting sites.

The bulk of neotropical migratory bird diversity is found in riparian ecosystems. Over 60% of the neotropical migratory birds in the West utilize the food, water, and cover of riparian areas during

breeding or migration (Krueper 1992). Of the two riparian corridors available on the Pocket/Baker 20K, Horse Tank Draw probably supports the greater number of neotropical migratory bird species due to the shrubs and trees it contains. However, the steep canyon walls and the lack of willows limit the number of neotropical migratory bird species present there. Cassin's kingbirds, and warbling vireos are some of the species that might be expected to breed there.

### Wildlife (Northern Goshawk) and Vegetative Structure

The principle forest types occupied by the goshawk in the southwest are ponderosa pine, mixed species and spruce-fir. The goshawk is a forest habitat generalist that uses a wide variety of forest ages, structural conditions and successional stages for nesting and foraging. Most of the Pocket/Baker ecosystem can be considered foraging habitat for goshawks, but there is relatively little nesting habitat due to the lack of a large tree component.

Northern goshawk nesting areas are usually located on northerly aspects in drainages or canyons, and are often near streams. Nest areas contain one or more stands of large, old trees with a dense canopy cover. According to the Goshawk Scientific Committee Recommendations (GSC) (Reynolds and others 1992), suitable nest site attributes includes having VSS 5 or 6 in groups or clumps. The post-family fledgling area (PFA) surrounding the nest site should be 54% B+ canopy and 6% C canopy. A goshawk pair occupies their nest area from early March until late September.

According to the GSC recommendations, approximately 60% of the potential foraging area should be in B+ canopy closure conditions. In addition, 2 snags per acre, 3 downed logs per acre, and 5-7 tons per acre of downed, woody material should be present to provide the ground level components for prey.

The goshawk preys on small-to-medium-sized birds and mammals which it captures on the ground, in trees or in the air. The food requirements of a single goshawk total to about 1 to 2 medium-to-large prey per day. Reynolds and others (1992) have researched and described the natural history, habitat and management recommendations for fourteen goshawk prey species. Of the fourteen prey species, habitat for all these species, except the blue grouse, is present within the Pocket/Baker 20K. Although little is known about how foraging goshawks use habitats, evidence suggests that they do so opportunistically. This opportunism suggests that the choice of foraging habitat by goshawks may be as closely tied to prey availability as to habitat structure and composition.

### Wildlife and Snags

Snag habitats are of high importance to a wide variety of wildlife species. In addition to serving as nest and roost sites, snags are used extensively by birds as hawking posts, singing or drumming posts, feeding substrates and perching and observation posts (Cunningham and others 1980). Snag dependent bird species can account for as much as 30 to 45 percent of the total bird population and may account for as much as 66 percent (Scott and others 1980). It is believed that secondary cavity nesters comprise about 1/3 of the total breeding species in a natural ponderosa pine forest, and comprise between 63% and 73% of the over-wintering individuals which are very likely exerting more control on insect populations at this time of the year as they consume next year's breeding population of these insects (Balda 1975).

The northern goshawk uses snags for hunting perches (Balda 1975). Work done on Merriam's turkey by Fred Phillips of the Arizona Game and Fish Department focused on the importance of snags as roosting sites.

Secondary cavity nesters such as creepers, wrens, warblers, flycatchers, bluebirds, and swallows constitute the bulk of neotropical migratory birds that can be found in the Pocket/Baker 20K. The lack of suitable nesting sites is the primary limiting factor for these birds (Cunningham and others 1980). They lack the morphological characteristics that are needed to create their own nesting cavities. Therefore, they depend heavily on the excavated cavities of primary cavity nesters that utilize snags.

It is likely that as the number of snags increases so will the population levels of the aforementioned species. A study by Keller (1992) reported that three neotropical migratory birds species were present in areas containing two to four yellow pines and/or snags per acre. This number increased to twelve species when there were eight or more yellow pines per acre. Here, Keller does not specify whether or not snags are present.

In addition to providing a sufficient number of snag recruitment trees, snag recruitment stands provide critical habitat for many species dependent upon the mature overstory of ponderosa pine. Mannan (1980) suggested that the elimination of older forest age classes caused by timber management may have a particularly strong impact on several bird species. According to Mannan, the effects of altering natural assemblages of bird species upon forest systems are unknown, but it is conjectured that a reduction in the number of insectivorous birds may result in reduced stability.

The importance of snag recruitment stands to contain mature and overmature trees (large trees) is further supported by studies which demonstrate the longevity of larger dbh snags, and preferential use of these larger snags. Of trees killed by the mountain pine beetle in northeastern Oregon, ponderosa pine snags greater than 50 cm (20") dbh stood longer than smaller ponderosa pines (Bull 1983). This same research reported that fifty percent of ponderosa pine snags were standing eight years after being killed by the beetle. Scott (1978) determined that the most frequently used snags were trees dead six or more years, larger than 18" dbh, and having more than 40% bark cover. Balda (1975) strongly recommended that an attempt be made to maintain a regular distribution of snags throughout the forest to decrease intraspecific and interspecific competition for nesting sites.

Cunningham and others (1980) revised Balda's 1975 data, which supported snag densities of 2.6 snags/acre, to a "more realistic" density of 2.1 snags/acre to maintain secondary cavity nesters at natural levels in a mature ponderosa pine forest. Menasco (1983) determined densities of green trees required for snag recruitment to maintain viable wildlife populations during a 120-year timber rotation. Using a fall rate of 1.48 percent, Menasco calculated that 2 green trees (> 20" dbh) in addition to 1.8 snags (> 20" dbh) per acre will maintain enough snags throughout the rotation for minimum viable populations if adequate snag numbers exist initially. However, if there are only 0.5 snags per acre, Menasco reported that snag-dependent species will remain suppressed below minimum viable levels (40%) until the stand reaches an adequate size level to begin producing snags on its own. Menasco expressed some doubts regarding his snag falling rate data. Given higher snag falling rates for snags that are widely spaced and exposed, Menasco proposed that six recruitment trees per acre may be necessary to achieve two snags per acre.

Research has shown that snags can be physically created through various methods (USDA 1991b). Results from the Tusayan Ranger District (Kaibab National Forest) on a project that girdled and poisoned mistletoe infected trees indicated that all but 5% of the snags created (100% kill rate) were on the ground within 14 years (USDA 1995a). The Covelo Ranger District of the Mendocino National Forest baited ponderosa pines with western pine beetle pheromone. Of the 28 trees baited in 1990, all

were killed within a year (USDA 1994c). Though several unbaited trees were also attacked, none had died. The farthest tree killed from a baited tree was 22 feet. Fall rates on the newly created snags have not been determined.

## FIRE INTERACTIONS

### Fire and Soil Productivity

Factors related to productivity decline includes intensity fires (Hart and Hart, 1993). Fire effects on soils are greatly affected by the duration and intensity of soil heating and thermal conductivity of the soil. Those affects are reducing availability of nutrients through volatilization by excessive consumption of organics; degradation of surface structure from excessive heat; creating a hydrophobic layer which reduces soil moisture; and reducing microbial populations with lethal doses of heat.

Much of the nutrient base that determines soil productivity comes from duff and large woody material (Harvey and others 1989). The degree of consumption of duff and woody material, therefore, has a major influence on site productivity. Maintenance of long term soil productivity in forested environments is related to the amount of Course Woody Debris (CWD) that exists on site (CWD is tree limbs, boles and roots in various stages of decay). Graham and others (1994) recommend retaining at lest 5-10 tons/acre of CWD in ponderosa pine/Gambel oak forest types in Arizona. To retain soil productivity on mixed conifer sites in Arizona, Russ Graham recommends retaining 10-15 tons/acre of CWD (personal conversation between Dick Fleishman and Russ Graham).

Total nitrogen, a key element for plant growth, is frequently unchanged for light to moderate underburns in ponderosa pine (Kovacic and others 1986), while potassium, calcium, magnesium, and phosphorous (other key plant growth elements) were either increased or unchanged (Harrington, 1977). Inorganic nitrogen concentrations were shown to increase after burning by as much as twenty times (Covington and Sackett 1990). To maintain increased levels of nitrogen requires repeat burning at intervals of 4 years or less (Covington and Sackett 1990). Temperatures in light to moderate burn type in forested environments at the surface vary from 100 C to 400 C depending on fuel loading and species (Wells and others 1978).

High intensity, long duration wildfires or prescribed fires can be very detrimental to soil. At temperatures above 590 F for surface burns and 1200 F for pile burns, soil is sterilized and nutrients and microorganisms are destroyed.

Soil structure is altered by excessive heating when temperatures exceed 400 degrees C (Hungerford and others 1990). Bare soils resulting from burning can experience structure changes through the erosion process. The greater the soil heating, the longer the recovery by vegetation, the longer the time a soil is susceptible to erosion. The amount of soil moisture also affects the amount of soil heating. Wet soils conduct heat more rapidly than dry soils (DeBano 1989).

Often, the volatilization of organics forms a hydrophobic layer which repels moisture causing increased runoff, and decrease water availability for plants. Soil pores are often filled with ash and gaseous organic matter that is forced into the ground by the heat from the fire and then cools and returns to a solid state that coats the soil particles, thus reducing porosity. However, the intensity of the burn appears to directly affect soil porosity. Following a moderate burn in ponderosa pine, Haase (1986) reported increased soil moisture the following growing season.

Generally, the greater the soil heating, the greater the negative impact to soil microorganisms. Lethal temperatures for microorganisms are as low as 50 degrees C, depending on the type of microorganism and the soil moisture. Jurgensen and others (1981) and White (1986) reported increased populations of nitrifying bacteria after light to moderate burns. While initially being reduced, populations of microorganisms frequently increase several-fold after fires due to more favorable pH, soil moisture, and nutrient levels (Ahlgren 1974). Covington and Sackett (1984) reported increased forest floor decomposition after prescribed burning.

The past practice of machine piling and burning has had a profound effect on nutrient cycling. Piling of created and existing slash has all but eliminated biomass available for nutrient cycling. Along with the slash being piled, soil often ended up in these piles resulting in loss of the A horizon over vast areas. Damage to the soil resulted when piles were burned concentrating heat for prolonged periods, sterilizing the soil.

## Fire and Water Quality

Precipitation regimes play a major role in the effects to water quality from the burning in different vegetation types (Baker 1990). In general terms, ponderosa pine and mixed conifer types are considered high water and low sediment producing areas (Brown and others 1974, DeBano 1977, Hibbert 1979). Pinyon-juniper and chaparral vegetation types produce intermediate amounts of water and sediment, while the semidesert and desert areas produce little water and large amounts of sediments. Generally, hydrological responses to burning are minor where annual precipitation is less than 460 mm (such as lower elevations of pinyon-juniper woodland, desert scrub, and semidesert grassland) (Hibbert 1979).

Response to fire is exhibited as increases in overland flow and peak and total stream discharge, and changes in the physical properties such as temperature, dissolved oxygen, and chemical constituents. Sedimentation and increased turbidity appear to be the most serious threats to water quality following wildfire or prescribed burning (Baker 1990). However, light prescribed burns generally have little effect on hydrological responses due to the amount of residual surface debris and vegetation (Baker 1990).

## Fire and Fire-dependent Species

Mutch (1970) hypothesized that fire-dependent plant species have adapted to thousands of years of fire by undergoing structural and chemical selection for properties that make them more flammable. Vegetative reproduction following fire is the primary method of propagation for several members of the rose family. Ceanothus resprouts abundantly after fire (Pearson and others 1972). Bottlebrush squirreltail will increase five-fold by the end of the second year of burning (Gaines and others 1958). Alligator juniper sprouts well after fire. Oak tends to thin out and retreat when protected from fire (Brown 1958). Fire in the last 150 years, is responsible for creation of aspen and for its even-aged structure (DeByle and others 1987).

### Fire and Shrub/Herbaceous Production

Prescribed fire can improve wildlife habitat by increasing diversity in shrub and herb layers. Though nutritive values can be enhanced, they are short-lived and do not have as much impact as the increase in forage diversity.

In the Pinyon-juniper woodland different aged burns, intermixed with unburned areas maximize vegetation production and diversity. Studies from small birds and mule deer conclude optimum width of treated areas to not exceed 660 feet and 10 acres in size (Severson and Rinne 1990). Too much residual slash inhibits elk while offering mule deer some protection. Overgrazing and fire protection have created closed canopies difficult to prescribe burn.

Nutrient flushes from prescribed fires last from 2 to 5 years (Severson and Rinne 1990). Stark (1980) found light fires (less than 150 degrees F soil surface temperature) not suitable for improving the quantity or quality of browse plants. Burns to increase nutritive contents of forages while retaining as much nitrogen as possible should be around 550-600 degrees F (Severson and Rinne 1990).

Light to moderate burns can be beneficial to soils by providing nutrient flushes. Covington and Sackett (1990) reported increased forest floor decomposition after prescribed burning. Most prescribed burns fall into the light to moderate intensity level, with occasional small areas of high intensity, as seen and monitored on the Aztec Prescribed Burn area.

### Fire and Ponderosa Pine Regeneration

Due to the removal of litter and exposure to mineral soil, increased nutrient availability, and more favorable soil moisture conditions, fire enhances natural regeneration in ponderosa pine. Studies by Weaver (1952), Ffolliott and others (1977), Heidmann and others (1982), and Harrington (1985) all demonstrated that prescribed fire enhanced the amount and survival of ponderosa pine seedlings. And while seedling establishment is rather prolific after a prescribed fire, the survival of those seedlings decreases dramatically with time (Ffoliott and others 1977, Dieterich 1980, Haase 1986). On sites where Gambel oak is rather profuse, a potential problem with seedbed preparation is the proliferation of oak at the expense of pine (Biswell and others 1973).

In association with the effects of past logging and grazing, conifers have invaded into meadows. The major cause of conifer invasion in the meadows is fire exclusion (Arno and Gruell 1986). Fire previously killed invading conifers and periodically expanded the meadows into the surrounding forest.

## GRAZING INTERACTIONS

Grass and shrub communities in the intermountain areas of the West evolved primarily in absence of large hoofed herbivores (Mack 1989). These communities evolved under a frequent, low intensity fire regime (Covington and Moore 1994) that reduced the buildup of old foliage and stimulated the plants, while keeping the encroachment by forest and woodland trees in check. Alteration of the fire regime to infrequent, but high intensity fires and a change in the numbers, concentration and class of livestock are linked together in a chain of ecosystem degradation processes that occurred after 1900. At lower elevations, overgrazing and fire exclusion combined to allow the encroachment of pinyon and juniper into grasslands.

General findings from studies of livestock grazing on various vegetation and soil types and under various stock rates are often cited as reasons to reduce or eliminate livestock grazing on public lands, particularly in the Southwest. In these studies, improper livestock grazing practices are shown to cause soil compaction, thereby reducing infiltration, increasing runoff, and reducing vegetative productivity. Poor vegetative production reduces the amount of organic matter available, which in turn affects soil productivity.

If properly used and managed, livestock can and are being used as an effective and cost efficient tool to improve soil productivity. Vegetative production and productivity have increased the organic matter content of the soils on range allotments within the West Clear Creek ecosystem through use of intensive livestock management adapted for the specific conditions and needs of this area. (Pivot Rock Range Inspections 1988, 1989, 1990; Hackberry/Pivot Rock Range Inspections 1989, 1991, 1991, 1993; Walker Basin Range Inspections 1993, 1994).

Hart and Hart (1993), in their extensive review of literature on grazing and its application to Southwest rangelands (desert scrub and pinyon-juniper grasslands), conclude that impacts of grazing systems in general on soil productivity, especially as applied to the arid and semi-arid ecosystems of the Southwest, are not yet addressed in a comprehensive fashion using credible research methods.

Hart and Hart (1993) summarized that the greatest effect from livestock grazing on Southwest rangelands is through the modification of soil hydrologic properties via the reduction of vegetative cover and the trampling of the soil surface. However, the effects of compaction by trampling are largely site specific, and are influenced by grazing intensity (Willat and Pullar 1983), soil texture (Van Haveren 1983), and soil water content (Warren and others 1986a, 1986b).

## Grazing and Stocking Rates

Conclusions of some studies reviewed by Hart and Hart (1993) agree that controlling stocking rates (animal demand per unit area per time) is the most effective means of mitigating the adverse effects of grazing on range conditions. Unfortunately, the "time" factor of the equation is partially or completely neglected in most references on grazing methods and impacts prior to 1959 (Voisin 1959). Pieper and Heitschmidt's (1988) review of literature on short-term grazing systems note that destocking is the quickest and most viable method to reduce current deterioration trends, but then state that total and continued rest is unnatural as well. In brittle environments, where moisture is limited and natural decomposition is slow, continuous rest (overrest) allows plants to accumulate several years of old plant material. Photosynthesis by new plant material is blocked by shading from the old material, roots are severely damage, nutrient storage is depleted, and, as plants die, succession starts the shift from grasses to forbs, shrubs and trees (Savory 1988).

Proper stocking rates are important, particularly to leave enough forage to carry grazing animals through the nongrowing season. Other factors also enter the equation, with wildlife management in particular posing many questions (Savory 1988). Consideration of wildlife needs extends beyond forage for grazing animals to cover for fawning and calving, forage for ground dwelling mammals and songbirds, and habitat for prey species of predatory birds, mammals and snakes. In addition to livestock use, the length of time elk and other wildlife use an area should also influence proper stocking rates.

Length of time livestock graze an area can be controlled by herding or fencing, or a combination of both. The length of time wildlife use an area can also be manipulated by using livestock to improve the condition and palatability of forage (Miller and others 1995). Studies also show that burning old grass

plants can be used to "freshen up" rank, unpalatable forage and make it more attractive to elk and other wildlife ungulates.

## Grazing and Soil Compaction

Warren and others (1986b) studied responses on bare soil surfaces from trampling under intensive rotation grazing and found increasing compaction with increasing stocking rates. The study also showed compaction increased with soil moisture conditions. However, to fully understand the implications of this study, the element of time (as it relates to the impacts of trampling on soil) needs to be included. There is no reference to the element of time in the results of this study. In addition, there is some discussion among soil scientists that what is sometimes labeled as compaction under wet conditions may actually be displacement.

Van Haveren (1983) found coarse-textured soil bulk densities were not affected by grazing intensity in a short grass prairie, while compaction on fine-textured soils increased with grazing pressure. However, he found that both coarse and fine textured soils could support moderate grazing with no compaction effect. Dormaar and others (1989) found significant compaction from short-duration, high-intensity grazing scheme on rough fescue range in Canada in a soil with 46% sand and 27% clay. In reviewing other studies on short-duration grazing, Bryant and others (1989) noted increased soil compaction on Texas area grasslands.

Photo points established to monitor livestock grazing impacts in the Red Hill Demonstration Cell on the Blue Ridge District of the Coconino National Forest show defined trails near the cell center in two paddocks immediately following a 2-4 day graze by livestock. This defined trail indicates a potential compaction problem. However, follow-up photos of both areas after the summer growth period show little evidence of these livestock trails. These results show the element of time - length of graze period and recovery period - influences the recovery of potential soil compaction.

## Grazing and Water Infiltration

The water cycle is one of four fundamental ecological building blocks, but is often given only partial importance when determining desired conditions for an area. If an assumption is made that livestock grazing will cause deteriorated watershed conditions (increased bare soil and decreased litter and plant cover), then the effects will be increased runoff and soil movement and less water infiltration. As a result, dams and water catchments will fill with silt, rivers will be unstable and prone to flash flooding, groundwater supplies will be lower, and springs will dry up.

In the semi-arid southern Great Plains, Rhoades and others (1964) found water-intake rates were inversely proportional to the grazing intensity. The decrease in the amount of vegetative cover associated in this study with increased stocking and soil compaction were contributing factors. However, little soil loss occurred on all grazed and nongrazed sites and the runoff was usually clear.

Rauzi and Hanson (1966) studying 24 years of grazing noted water intake rate was linear with grazing intensity. Warren and others (1986b) found that the highest stocking density of three densities studied (1.7, 1.3, and 0.8 acres per animal unit) produced the lowest infiltration rate and the greatest sediment loss. Warren and others (1986a) also found that sediment production was related to total aboveground biomass.

Rich and Reynolds (1986) studying grazing intensity on chaparral lands in central Arizona noted that ground cover does not deteriorate if no more than 40% of perennial grass production is removed at the end of the summer. Johnston (1962) studying the effects of grazing intensity and cover on water-intake rates on ranges of the eastern slopes of the Rocky Mountains found that the rate of water-intake increases with an increase in the amount of standing vegetation or natural mulch. He found that even after 10 years of heavy grazing, soil erosion by water was not a critical factor.

Water infiltration rates declined sharply under severe levels of trampling in tests done with an artificial hoof (Abdel-Magid and others 1987a). Warren and others (1986a) found infiltration rates decreased significantly and sediment production increased significantly on a site with a silty clay surface soil devoid of vegetation under intensive rotation conditions. Blackburn (1984) and Gifford and Hawkins (1978) noted that while heavy continuous grazing is detrimental to soil hydrologic properties, moderate or light continuous grazing are significantly less deleterious and frequently not significantly different from each other.

One important factor not discussed in most studies on water infiltration is soil capping. When raindrop impact breaks down surface crumb structure, the organic and lightweight material is freed to wash away, while heavier fine particles settle and seal, or cap, the soil. The importance of crumb structure to water penetration is easily demonstrated by comparing a bowl of wheat grains and one of flour. Neither has a "cap" at the onset, but when water is poured on each the water soaks into the larger grain particles and the surface of the flour is immediately sealed and the water runs off (Savory 1988).

To reduce soil capping and increase water infiltration requires a break up of the soil cap. If grazing is the selected treatment, the element of time must be incorporated into the treatment plan to break up the soil capping, creating, in place of a sealed surface, divots and loose well aerated soil surface areas which will allow water to infiltrate into instead, of run off the soil. However, if animals are allowed to remain in an area for too long a period of time, this treatment can and will have negative effects and well aerated soils are replaced with hard over compacted soils.

An example of improving water infiltration using livestock as the soil disturbing agent is the current condition of several springs on the Hackberry range allotment. Springs that were ephemeral in the late 1980's and early 1990's are now perennial, though records do not show an increase in annual precipitation. This increased spring water is attributed to increased water infiltration resulting from treatments on the uplands to break the soil cap using properly managed livestock grazing as the disturbing agent (Hackberry/Pivot Rock Range Inspections 1993, 1994, 1995). Properly managed livestock grazing in this case includes length of graze in relation to plant phenology, stock density and allowing for complete plant recovery prior to a regraze by livestock.

## Grazing and Water Yield (Runoff)

Leithead (1959) studying runoff in relation to range condition on rangelands in Texas concluded that, due to the rainfall pattern, improving the range would have no effect on the amount of water leaving the watersheds. Liacos (1962) studying California grasslands demonstrated how increasing grazing intensity increases runoff. Focusing strictly on runoff management, he made no conclusions regarding erosion.

In the salt-desert shrub of Colorado, Lusby (1970) showed that increasing water yield and sediment production was correlated to increasing levels of stocking. Turner (1971), also studying soil and grazing influences on the salt-desert shrub concluded that soil characteristics were responsible for most of the differences noted from studying impacts to soils under varying grazing schemes.

Weltz and Wood (1986) found sedimentation results different on a mesa top than on a plains grassland in New Mexico comparing short-duration grazing and continuous grazing at various stocking levels, and exclusion. On the mesa top site, sediment production was least in the exclusion sites, but not significantly different among the various stocking levels. On the prairie site, total sediment production in the grazed short-duration pasture was triple that in the moderate, continuous pasture.

Wilcox (1994) studying runoff and erosion in pinyon-juniper woodlands on an area where livestock grazing had been excluded for the last 50 years found that the runoff event occurs twice yearly; once during snowmelt and second mid summer (generated by thunderstorms). He found that erosion increases with the increase in bare ground, and that most of the erosion is produced by summer thunderstorms. He concluded that runoff is an important mechanism for the redistribution of water, sediments, nutrients, and contaminants in pinyon-juniper woodlands.

Improper grazing or overrest in brittle environments will lead to increased bare ground, thus increasing water runoff (Savory 1988).

## Grazing and Cryptogamic Crusts

Cryptogamic crusts have been shown to be susceptible to degradation through a variety of disturbances including fire and trampling, and may require lengthy periods in which to recover from such disturbances (Anderson and others 1982a). Brotherson and others (1983) found areas subject to grazing supported significantly less cryptogamic cover in Navajo National Monument where 40 years of continuous grazing has occurred.

While some studies reported crusts dominated by algal-lichen species enhance infiltration (Loop and Gifford 1972; Harper and Marble 1988), other studies have shown cyanobacteria and lichen crusts may impede infiltration (Brotherson and others 1983). The latter result prompted Savory and Parsons (1980) to conclude that hoof action (intensive trampling from short-duration rotation grazing) was necessary to break up the crusts for infiltration improvement. However, Abdel-Magid and others (1987b) concluded that there was no clear advantage from short-duration grazing for improving water infiltration by destruction of surface soil crusts on short grass prairies.

Because crusts tend to "cement" soil fragments into cohesive units and produce roughened surfaces, they are thought to reduce the severity of wind erosion (Brady 1974). However, the study cautions that this conclusion is based on personal opinion and lacks quantitative data. West (1990) in his extensive review of microphytic soil crusts, finds that the current state of knowledge regarding functioning of microphytic crusts as indicators of soil condition and ecosystem vigor to be inadequate. Hart and Hart (1993) conclude that there is a great need for further research into the tolerance of crusts to disturbances such as grazing, fire, recreation, and pesticides.

Anderson and others (1982b) believe that range management schemes can be designed to favor cryptogamic crusts. They suggest that prolonged grazing during seasons of low precipitation, high temperatures, and persistent wind be avoided, as hot, dry conditions make the crusts very susceptible to damage. To minimize soil erosion by both wind and water, they suggest adjusting the timing of grazing such that cryptogamic crusts growth occurs unimpeded prior to the hot, dry season.

## Grazing and Plants

Research has repeatedly documented that intense levels of defoliation significantly reduces a plant's ability to photosynthesize, which may reduce the plant's vigor. By altering the competitive ability of individual plants a shift in plant composition and community structure may occur. Most of the studies which produced results in support of grazing as a benefit to plants have been conducted in absence of livestock (Belsky 1987).

In addition, defoliation can occur through cattle movement (trampling or animal walking). Brown and Evans (1973) found that a key factor in pasture damage was the amount of animal walking. Using an artificial hoof, Abdel-Magid and others (1987a) found that the loss of living biomass from severe trampling on native shortgrass sods in a greenhouse was 15-25%; loss due to moderate trampling was approximately 5%. The authors concluded that less vegetation is trampled in short-duration grazing systems. Savory (1988) states that repeated plant defoliation by livestock during the growing season (overgrazing) occurs in two situations:

1. When animals stay long enough in one area to regraze fast-growing plants before the plants recover from the first grazing, and

2. When animals return to graze slow-growing plants before the plants have time to recover from a previous grazing.

Reduction of vegetative cover results in less organic matter being available for incorporation into the soil, which results in less porous soils. Overall declines in herbage biomass, organic matter content, and soil porosity have been repeatedly shown to be correlated with increasing grazing intensity (Weltz and others 1986; Heitschmidt 1990).

In summarizing studies on the Sonora Experimental Range in Texas, Taylor (1989) noted that infiltration rates were lower and sediment production was higher after short-duration grazing periods than on nongrazed pastures. Thurow and others (1986) attributed the results to the amount of plant cover, indicating that 300-500 pounds per acre of organic cover is necessary to minimize soil erosion.

The importance of the length of time livestock graze an area, rather than the number of animals, in controlling overgrazing is also supported by Voisin (1959). Most studies conducted in the U.S. have concentrated efforts on utilization and in trying to match livestock numbers with a set degree of utilization based on available forage. Little, if any, research has been conducted on the correlations of livestock graze periods with plant phenological conditions. A 30-day graze period during fast plant growth results in large numbers of plants being regrazed, while the overall utilization percentage within the pasture can be within arbitrarily set desired limits. The result is selected overgrazing of the highly palatable plants and large areas of overrested less palatable plants.

The so-called short-duration grazing schemes have little value in determining the effects of overgrazing on species diversity or watershed conditions if the plants are grazed a second time before recovery has occurred, or livestock are allowed to remain in a pasture long enough for previously grazed plants to be grazed again.

The most concise information available regarding time-controlled intensive grazing is from the 12 sets of permanent range clusters established on the Red Hill grazing allotment located on the East Clear Creek watershed (approximately 20 miles northeast of Pocket/Baker). In 1984, 12 clusters consisting of three 100 foot transects each were established prior to application of an intensive grazing method. These transects were reread in 1989 and again in 1994. Data from the three readings were tabulated and

compared in 1995. Although not statistically sound the trends from this information are interesting. The area covers approximately 20,000 acres with an existing understory condition of approximately one-half cool season species (crested wheatgrass) and one-half warm season species (blue grama). The area is a key winter elk use area. Vegetation and soil trends were as follows:

> 1985--The area is approximately 50 percent crested wheatgrass which is mainly in an overrested condition. The remaining plant community is largely comprised of blue grama, a warm season specie. Elk numbers are estimated at 300 wintering animals. Management strategies for the next five years were to reduce the amount of overrest through increased stock densities, decrease the amount of overgrazing through the length of graze periods from livestock. Originally there were no wildlife goals established for the area. Livestock production and land treatment to the overrested cool season plant community were successful during the first three year period. Freshening up the cool season plant community resulted in more late fall, winter and early spring elk use. Serious overgrazing by a combination of elk and cattle resulted in the following trends when the transects were reread in 1989:
>
> 1989--The area is approximately 70 percent blue grama and 30 percent crested wheatgrass. Overrest was no longer a problem as the majority of rank plants had been removed from the area. Wintering elk numbers had increased to over 700 head. Soils on the area were in a static to slightly upward trend due to the increase in blue grama but species diversity was in a decline. Management strategies for the next five year period were to establish wildlife goals whereby drought reserves were left for wildlife (complete yearlong rest on over a third of the area). Livestock were not allowed on the area until plant recovery from the spring elk graze was accomplished, elk numbers were scheduled for reductions. Livestock management consisted of later entries, scheduled complete rest of one-third the area, an early light graze followed by a later somewhat heavier graze on one-third the area and a moderate to heavy graze on one-third the area. The results of this type of management were as follows when the transects were reread in 1994:
>
> 1994--A dramatic increase in the cool season community with more plant diversity (crested wheatgrass, western wheatgrass and squirreltail) and more diversity in the warm season community (blue grama, large patches of vine mesquite, sand dropseed and sideoats grama). Elk numbers have been slightly reduced through increased hunt permits. The area is about where it was in 1984 from a cool season-warm season relationship. The main difference is there appears to be more species diversity now than in 1984. Transects show an increase in plant density and composition from 1989-1994 as well as a continued decrease in bare ground from 1984-1989 and 1989-1994.

Jasmer and Holechek (1984) reviewed methods to determine grazing intensity, including the use of general reconnaissance and ocular estimation. The disadvantage to ocular estimation is that the data collected has limited utility in research. The researchers concluded that there is no one singular method that measures grazing intensity simply, rapidly, accurately, and with precision among observers, and conclude that general reconnaissance and ocular estimation may be the best means of evaluating grazing intensity for those who need to make routine management decisions.

## Grazing and Exotic Plants

The development of exotic plant communities may result in long-term soil productivity losses due to the shallow fibrous root structure compared to the deep-spreading rooting nature of many exotics. Cheatgrass, originally from the steppes of Eurasia, spread as a result of overgrazing, altering the fire regime because it grows in dense, flashy patches. Long-term implications of cheatgrass invasion is the elimination of species now threatened by increasing fire severity brought on by cheatgrass. The conversion to simplistic, unproductive ecosystems and resulting drastic reduction in biodiversity will eliminate species associated with native systems (Billings 1994). The nonmycorrhizal exotics further affect soil productivity with a decline in fungal populations (Goodwin 1992).

On sites with rainfall over 14 inches, cheatgrass competition can be controlled sufficiently through mechanical tillage, herbicide application and fire in association with seeding of native species (Monsen 1994). Restoration on sites that are drier have not proven to be successful. The opportunity to control cheatgrass with cattle grazing was explored by Vallentine and Stevens (1994). They concluded that there are limited opportunities and only when native perennials still exist in significant numbers; (for example) intensive grazing during the cheatgrass seed stage.

## Grazing and Woody Plant Invasion

Arid or semi-arid rangeland consists of the desert scrub and the woodland forest type. The degradation of these rangelands is often characterized by the successional advance of woody plant species at the expense of existing species which are desirable as forage for grazing animals. Encroachment over the last century of pinyon and juniper and of mesquite and creosote bush into semiarid and arid grasslands has been substantial (Hastings and Turner 1965; Evans and Young 1987; Grover and Musick 1990).

Woody plants are dominant over large portions of arid and semiarid rangelands in the Southwest. The effect has been a plant community with reduced diversity and productivity (McCalla and others 1984a, 1984b; Bedell 1987, and increased surface soil erosion (Bedell 1987; Grover and Musick 1990). Improper grazing is often cited (among grazing, fire, climate, and cessation of Native American activities) as the primary cause (Pieper and Heitschmidt 1988, Taylor 1989, Brown and Archer 1989).

Grass competition in pinyon-juniper communities held the stands more to rocky ridges and shallow soils prior to settlement of the Southwest (Springfield 1976). When grazing intensity sufficiently removed the grass competition, fire was excluded and the trees encroached on previously open grasslands. Density also increased within the original pinyon-juniper stands.

Yorks and others (1994) found that a substantial reduction in livestock grazing density in 1933 resulted in 1989 in a small but significant trend toward recovery of some of the original diversity and species composition in the pinyon-juniper woodland type.

In a brittle environment, overrest allows grass plants to accumulate several years of old plant material. As a result, photosynthesis is blocked, roots suffer severe damage, and succession shifts to forbs, shrubs and trees (Savory 1988)

Photo documentation of a grassland community being invaded by pinon juniper just north of Flagstaff, Arizona is a dramatic example of what overrest in brittle environments can lead to. This documentation is from 1905 to 1957 and 1957 to 1986. From 1957 to 1986 the grass community continues to be depleted with little, if any, livestock use. Plant overrest is plain in the more recent photos with large

numbers of plants in the moribund stage. Other than this photo documentation, there is little reference (except for Savory (1988)) referring to overrest being the primary cause of the takeover of woody vegetation.

## Grazing and Meadows

For most of this century, domestic livestock congregated in meadows due to water availability, succulent feed, inappropriate salting practices, and ease of herding. Forage production declines on forested areas where dense regeneration outcompeted herbaceous species exacerbated the situation. This resulted in the replacement of palatable, fibrous rooted grasses, sedges, and rushes with dry site species; heavy soil compaction and sheet and gully erosion; and eventual lowering of the water tables (USDA 1996b). Even after extensive livestock watering infrastructures were developed, grazing in meadows has persisted due to proximity of historic tanks, higher forage palatability during dry periods and inappropriate salting practices in some areas. This century old trend has been exacerbated by large elk herds which use some meadows year round.

Reanalysis/revisiting of permanent range analysis transects and photo points show a stable trend in most areas, and a slightly improved trend in others over the past 30 years (USDA 1996b). No major changes in species composition have occurred, and tree regeneration is negligible. In comparison to 1960's conditions, there is significantly higher light intensity reaching the forest floor, the result of immature tree groups aging and intensive precommercial thinning and pulpwood harvests. Single storied structures along meadow edges are more common today, with the results being a long term decline in snag densities which benefit open field species such as kestrels and bluebirds.

Although many studies tie poor plant diversity and watershed conditions in meadows to livestock grazing, several factors should be considered when assuming this link:

1. Length of time livestock graze the meadow and during what season,

2. Vegetation and soil conditions in the area surrounding the meadow, and

3. Other grazing ungulates and their impacts to the meadow and surrounding area.

Elk and livestock tend to concentrate in meadows because palatable forage and generally water are available in these areas. When two grazing ungulates are present, evaluating the impacts of one without evaluating the other's impacts will lead to incorrect results. Usually, mountain meadows found on the Coconino National Forest are associated with adjacent pine bunchgrass understory communities. These pine bunchgrass communities (usually Arizona fescue and mountain muhly) are not highly palatable to wildlife or livestock because of the old, rank plant material. To make these plant more palatable to both elk and livestock, and thereby draw the animals away from the meadow, requires a treatment such as prescribed burning or intensive grazing to remove the old decadent growth and allow the fresh, palatable shoots to emerge. Both methods have been used on the Coconino National Forest, and the West Clear Creek area in particular, with excellent results. To maintain the palatability of the pine bunchgrass community, burning or intensive grazing should occur every two years as a minimum.

On the Pivot Rock range allotment (adjacent to Pocket/Baker), increased stock densities for short graze periods resulted in an increase in elk dietary intake of Arizona fescue from almost zero percent before treatment to over 20 percent following regrowth from the intensive livestock graze (Miller and others 1995). This increased use by livestock and wildlife resulted in less use on the more palatable introduced grass species, orchardgrass and intermediate wheatgrass. These results hold true for vegetation in

mountain meadows. If the forage on the surrounding uplands are treated with either burning or intensive livestock grazing, the meadow should receive less use from both wildlife and livestock.

## Grazing and Riparian Communities

Conventional livestock management practices negatively impact riparian communities. During the colder winter months, livestock tend to move out of the colder riparian bottoms and up to the warmer sideslopes. During the warmer summer months, the opposite is true as livestock and wildlife tend to concentrate in the cooler riparian areas. It is during the summer months that peak growing conditions occur within the riparian areas and the greatest impact can occur to the vegetation. The results of long summer grazes in riparian communities include damage to woody vegetation and overgrazing of the fibrous rooted vegetation. Cattle compact soil by hoof action, remove plant biomass, and reduce water infiltration, all of which result in decreased vegetation density (Holecheck and others 1989). Riparian areas are damaged by channel disturbance or lowering of the water table. Yearlong and summer grazing has proven to be particularly harmful to riparian ecosystems (Kauffman and Krueger 1984).

Moderate to late fall grazing may have relatively little impact to the riparian zone, because water levels are typically low, stream banks are dry, and vegetation is dormant (Sedgewick and Knopf 1987, 1991). There are potential effects, though, even during this period. Sufficient plant cover needs to remain for spring stream flows (Clary and Webster 1989). Concentration in riparian areas and on more palatable instream riparian vegetation can deplete herbaceous cover and woody riparian vegetation (particularly willow). Short-term, early spring grazing can result in better distribution of the riparian zone, because upland vegetation at that time is succulent also (Clary and Webster 1989).

Several methods can be used to effectively graze riparian areas without damage. Phil Knight of the Date Creek ranch in central Arizona uses approximately 3 miles of perennial stream along Date Creek for livestock grazing. Approximately 20 years ago, he changed management from yearlong and/or summer use by livestock in the riparian area to winter use only with dramatic results. The riparian is now lined with lush expanses of diverse woody vegetation, the stream channel is deep and narrow with overhanging banks in many areas, and wildlife, particularly riparian dependent bird species are flourishing.

These same positive results to the riparian areas on the Hackberry allotment are well documented (Hackberry/Pivot Rock Range Inspections 1988, 1989, 1990, 1991, 1993, 1994). Grazing in these riparian communities of Twel Creek and Grapevie Springs is confined to short winter grazes only. As a result, three age-classes of woody vegetation are now present and the grass component is improving. Changes in livestock grazing management of the upland surrounding these riparian areas has also improved the water flow into these areas as discussed above.

In both Date Creek and the Hackberry allotment the changes have occurred because the total ecosystem, rather than just the riparian community, was considered. Proper grazing management and treatment of the riparians and the uplands as integral parts of the whole ecosystem has led to positive results for both components. In too many cases, fencing of the riparian component to exclude livestock and sometimes wildlife is viewed as the answer to problems in riparian areas. While the non-brittle riparian vegetation will respond quickly to removing the impact of grazers, little effort is given to improving the conditions of the uplands that are the water source for the springs.

## Grazing and Wildlife

Severson and Medina (1983) stated that positive results can be obtained with livestock with proper manipulation of stocking rates, kinds of livestock, intensity, season of use, and livestock distribution. But they note that research has not provided enough specific information applicable to the Southwest.

Studies report that elk and deer generally move out of an area when cattle are introduced (Wallace and Krausman 1987; Lyons 1985; Dwyer and others 1984; Crouch 1982). The reaction by elk and mule deer seems to depend on the stocking densities of livestock, habitat quality and season (Lyons 1985). Other studies observed that deer and elk follow livestock in rotational grazing systems, after plant regrowth has started, dining on new growth (Powell and others 1986; Cosby 1978; Hannemann 1991). Dietary overlap between cattle and elk can range from 30-50% for sedges, fescue and bluegrass. The highest competition occurs in meadows and inversely in distance away from water sources (Nowakowski, and others, 1982). Studies by Miller and others (1995) on the Pivot Rock allotment indicated grazing interaction between cattle and fall elk use occurred on 35.4 to 58.9 percent of the area. Arizona Game and Fish (1993) indicated that when an adequate forage base is sustained, elk will remain on their traditional ranges, noting that displacement of elk is related directly to an adequate (quality and quantity) forage base. Failures in the management of range resources at the Forest Service's Red Hill Study Area were due largely to insufficient consideration for the impacts of elk (USDA 1989, USDA 1995b (unpublished)).

Elk use patterns favor following behind the livestock graze taking advantage of plant regrowth (Miller and others 1995). This pattern has also been observed and documented on the transition country of the Apache Maid allotment (Range Inspections Apache Maid Allotment 1993, 1994 and 1995). Elk use on the rested portions of the Transition pastures of Apache Maid allotment was not high enough to prevent cool season introduced species of high palatability from heading out and plant reproduction to occur. The importance of yearly scheduled rest when two competing grazing ungulates are present is well documented on the Red Hill grazing study (USDA 1987b).

Effects of grazing on the Mexican spotted owl have not yet been substantiated with research studies. However, research has identified specific habitat requirements for the prey species taken by MSO's. Research also has been done on the effects grazing activities have on MSO prey species densities and diversity. Based on prey species research, and the known effects grazing imposes on soil and vegetation suggests that grazing influences MSO prey availability and habitat conditions (USDI 1995).

Mexican spotted owl prey on a range of species, including bats, small mammals, birds, and arthropods. Of these, small mammals provide the bulk of the MSO diet. The deer mouse is a habitat generalist, occupying all vegetation types which provide more openings, and less shrub and understory canopy on more level terrain. Deer mice also prefer habitat conditions with less oak, but a greater accumulation of slash and litter depth (Ganey and Block (unpublished) in USDI 1995). Studies cited in the Mexican Spotted Owl Recovery Plan indicate grazing has little effect on deer mice (Reynolds 1980 in USDI 1995), but significantly decreases vole populations, due to loss of cover in mesic habitats (Grant and others 1982 in USDI 1995).

In the proposed listing for the Mexican spotted owl (Federal Register vol. 59, no. 234, published December 7, 1994), the U.S. Fish and Wildlife states that "there is no direct evidence that grazing adversely affects Mexican spotted owl critical habitat, and thus grazing allotments should not be affected by critical habitat designation." (p. 29926). Additionally, the final rule (Federal Register, vol. 60, no. 108) identifies livestock grazing in riparian habitat as having potential to adversely affect critical habitat (p. 29933).

There have been few studies regarding the effects of grazing on neotrops outside of riparian habitats (Bock and others 1992). Likely impacts, however, based on consideration of terrestrial plant communities and changes that have occurred since the late nineteenth century, are that species dependent on herbaceous and shrubby ground cover for nesting and/or foraging, or species requiring open savannas have declined (Bock and others 1992).

**Grazing and Fire**

The effects of fire exclusion and grazing have resulted in the proliferation of seedlings and shrub species, with grazing identified as the primary agent of change. Improper grazing was shown to be the primary factor to increase conifer seedling establishment (Zimmerman and Neuenschwander 1984; Rummell 1951), and also be the primary agent for the invasion of woody species in grasslands (Pieper and Heitschmidt 1988; Taylor 1989; Walker and others 1981).

In determining that improper livestock grazing was the primary agent of change in the widespread conversion of savannah to forest in ponderosa pine, Madany and West (1983), found that pine, oak and juniper sapling density were much higher on grazed areas than on relict mesas. Zimmerman and Neuenschwander (1984), studying forest fuels community structure changes as a result of grazing in the Douglas-fir/ninebark community of Idaho, concluded that continued livestock grazing (improper grazing) without fuel management will cause reductions in the frequency of low intensity fires, and increases in the occurrence of infrequent high intensity fires.

The cumulative effect of fire suppression and improper livestock grazing, combined with the effects of periodic droughts, could have amplified the changes in vegetation to a greater degree than either grazing or drought alone (Grover and Musick 1990). Vogl (1974) noted that the combined effects of fire and grazing can be entirely different than from the results of fire alone. Bock and Bock (1978) explain the loss of sacaton grasslands in southwest Arizona from heavy grazing and trampling following a severe burn.

Improper livestock grazing enhances the establishment and growth of conifer trees by removing grasses which would otherwise prevent seedling establishment and growth. This occurs only when grasses are removed to the point that competition is eliminated or grasses are incapable of or prevented from carrying low intensity fires. Pearson (1923), Weaver (1943, 1947, 1950, 1961), and Cooper (1960) all recognized the development of dense pine thickets in areas that were heavily grazed. Cattle were used as a biological agent to heavily graze a seeded burn to allow the survival of plantation seedlings (Koehler and others 1989).

Proper livestock grazing can enhance forage production following a burn. Pinon juniper areas burned on the Fossil Creek allotment increased forage production yearly following the burn by over 60 percent. Livestock were not allowed to enter the burned areas until seed maturity had occurred. High density grazes of not over 15 days during plant growth and 20 days during plant dormancy were then initiated. Forage production went from less than 100 pounds per acre prior to the burn to 200 pounds per acre immediately following the burn. One year after the first livestock treatment production went from 200 to 800 pounds per acre. After the second livestock treatment forage production went from 800 to 1200 pounds per acre (Fossil Creek Range Inspection 1993).

## LOGGING INTERACTIONS

In the 1950's and 1960's an agricultural model for timber management increasingly influenced the type of timber harvest activity with even-aged management prescriptions. The net result in association with fire exclusion has been the removal of most of the large old-growth trees and their replacement with dense stands of young trees (Covington and others 1994). Increased conifer populations have reduced understory diversity, aspen stands, and meadows.

The past practice of machine piling and burning has had a profound effect on nutrient cycling. Piling of created and existing slash has all but eliminated biomass available for nutrient cycling. Along with the slash being piled, soil often ended up in these piles resulting in loss of the A horizon over vast areas. Damage to the soil resulted when piles were burned concentrating heat for prolonged periods, sterilizing the soil.

## SUMMARY OF MAJOR INTERACTIONS WITHIN POCKET/BAKER

### Summary of Soil/Water Interactions

- Except for well-used recreation sites, roads, trails, and landings, compaction appears to be minor except in meadows where recreationists and livestock grazing appears to be the main causes.
- Roads within stream courses or filter strips are contributing to the sediment loads in the downstream water quality and contributing to the non and partial support of water quality standards.

### Summary of Aspen Interactions

- Aspen provide significant habitat for neotropical migratory birds.
- Aspen patches are rapidly declining, and without restoration efforts, will die out. Restoration of aspen patches may be accomplished using mechanical disturbance rather than fire. Protection from ungulate grazing is required.

### Summary of Wildlife Interactions

- The ponderosa pine matrix has the highest use by all Coconino Forest wildlife species, as well as highest use by dependent species, indicator species, and neotropical migratory birds.
- The majority of Coconino species prefer the mature/old growth component for part or all of their needs. The majority of species also prefer dense canopy.
- Guidelines for current and future nesting, roosting and foraging habitat for the Mexican spotted owl are set forth in the Final MSO Recovery Plan. A key theme is to maintain current nest/roost habitat and encourage, but not set back, conditions for the development of future nest/roost habitat.
- The desired condition of vegetative structures (acres of each VSS class, snags, downed logs, etc.) for goshawk habitat closely resembles conditions preferred by a majority of Coconino wildlife species.

- Neotropical migratory birds are highly dependent on snags. The mosaic of vegetative stand structures enhances the differing guilds of neotrops.

- Snag dependent bird species may account from 30-66 percent of the total bird population. Approximately 6 recruitment trees per acre are needed to maintain 2 snags per acre.

**Summary of Fire Interactions**

- Soil productivity and water quality are maintained or enhanced by limiting soil heating, retaining coarse woody debris, and limiting the practice of machine piling.

- The productivity and vitality of fire dependent species and the vitality, diversity and nutritive values of shrubs and the herbaceous plants are enhanced by light to moderate intensity broadcast burning.

**Summary of Grazing Interactions**

- If properly used and managed, livestock can and are being used to improve soil productivity. Observations on and adjacent to Pocket/Baker indicate that the retention or enhancement of hydrological soil properties for the maintenance of site productivity can be achieved by time-controlled intensive livestock management and/or nonuse as options to current management.

- Information on the existence and condition of cryptogamic crusts on the approximate 460 acres of pinyon-juniper is lacking. However, much of the research citing negative impacts studied high stocking numbers, continuous year-round grazing, and/or fragile and dry desert-like soils. There are no such conditions on Pocket/Baker.

- The lack of meadows (totalling less than 10 acres) in this area and their small size (generally 1/4 acre in size) results in minor use by cattle.

- The lack of accessible riparian communities results in the lack of influences by cattle on riparian systems.

- The effects of fire exclusion in combination with improper grazing techniques are not having the same affect on this ecosystem as it did in the first half of this century. The reasons are that heavy overgrazing is not occurring and most forested sites are already stocked with young to middle-aged trees. Thirty years of logging, thinning, prescribed fire, and changes in grazing management have substantially reduced the dense thickets of trees produced earlier this century.

**Summary of Logging Interactions**

- Intense, agricultural type management (even-aged management) for timber resulted in the removal of most large old-growth trees, and the retention of young and middle-aged forest conditions. However, the net result of logging, thinning, and prescribed fire over the past 30 years has reduced overall stand densities such that the majority of the area is in open to moderately closed canopy condition.

# CHAPTER 6 - DISTURBANCES

This chapter describes the existing condition in terms of:

- the most influential natural disturbance agents on the successional patterns of the Pocket/Baker ecosystem.

Most of the time, ecosystems operate in dynamic equilibrium (Leopold and others 1964 and Odum 1971). The natural range of variability in an ecosystem includes the dynamic equilibrium range and disturbances. Although they disrupt socioeconomic expectations, disturbances are essential ecological processes, necessary at some levels for the long-term sustainability and productivity of most ecosystems. One of the goals of ecosystem management is to sustain its resilience, a term that describes the ability to recover quickly to conditions and relationships existing prior to the disturbance (Holling 1973). Ecosystems with frequent disturbances are more resilient, but are less stable.

The most common disturbance agents are disease, drought, fire, insects, flood, and wind. There have been a few accounts of severe down drafts or tornados that blow down several acres of trees in the area of the Pocket/Baker ecosystem, but wind rarely affects much more than individual trees scattered over a large area. In combination with heavy snows, wind often cause widespread breakage of limbs and tree tops. Localized insect outbreaks occur when the breakage areas provide sufficient slash. In the ponderosa pine/bunchgrass ecosystem drought manifests itself as an increase in insect populations.

The report on insect susceptibility in the Pocket/Baker ecosystem lists no significant outbreaks of insects currently or in the recent past (64, 83). While bark beetles have not caused real outbreaks, it is well within the realm of possibility that such outbreaks will occur in the future (135).

Of particular importance to the ponderosa pine/bunchgrass and pinyon-juniper ecosystems in the Pocket/Baker area are fire and disease (particularly dwarf mistletoe).

## FIRE

Prior to European settlement, forest conditions were maintained by naturally ignited fires on a regular basis. Dietrich (1980) found an average fire interval of 4.9 years over a 336 year period in ponderosa pine, and an average fire interval once every 22 years in mixed conifer (Dietrich 1983). Within ponderosa pine stands, light surface fires occurred usually at less than 10 year intervals (Dietrich 1980). These fires created an uneven-aged stand structure composed of small, relatively even-aged groups (Harrington and Sackett 1990).

Fires were also set by Native peoples and early settlers. One historical account of this is an 1890 Oak Creek settler who recalled seeing huge clouds of smoke, set by sheepherders to torch off their grazing lands, while they were heading for the southern grazing areas. They hoped to return in the spring to rich vegetation growing in the previously burned areas (Sawyer 1976). This is an important indication that the air may not have always been clear.

As a result of fire exclusion, stand stagnation has occurred in seedling and sapling thickets; trees show signs of reduced vigor and growth; open stands at the turn of the century now have dense understories; and in combination with timber harvesting and early century overgrazing, fire exclusion has created a

sea of small diameter trees with relatively dense canopy structure (Harrington and Sackett 1990, Covington 1993).

## DWARF MISTLETOE

Dwarf mistletoes are the most prevalent disease causing agents in Southwestern forests. The most prevalent host-specific mistletoes in the Southwest infect ponderosa pine or Douglas-fir. On the Coconino National Forest, Hessberg and Beatty (1985) estimated that approximately 32 percent of the commercial acres of ponderosa pine are infected by southwestern dwarf mistletoe. Incidence is believed to have increased in the past 30 years since Andrews and Daniels (1960) reported the pathogen present on 30 percent of the Coconino Forest. Past practices of fire suppression and selective harvesting may have exacerbated the dwarf mistletoe in southwest ponderosa pine stands (Maffei and Beatty 1988).

### Current Dwarf Mistletoe Condition

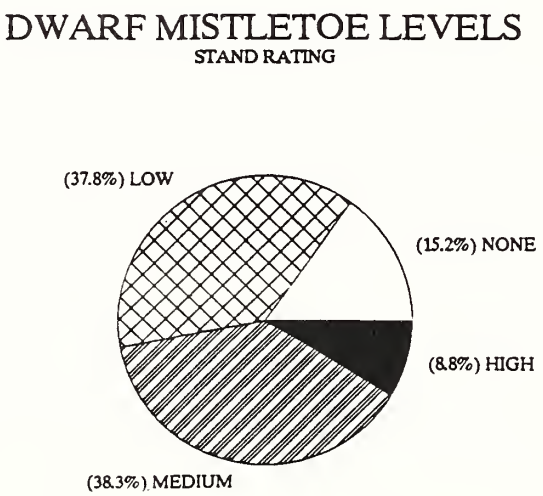
The Pocket/Baker ecosystem was analyzed for the presence of southwestern dwarf mistletoe. The following describes the levels of infection in the survey (85):

**High-** Infections are found throughout the site varying in intensity from light to heavy (defined by standard 6 class rating system developed by Hawksworth (1977)).

**Medium-** Infections occur in pockets, generally over less than half of the site with intensities varying from light to heavy.

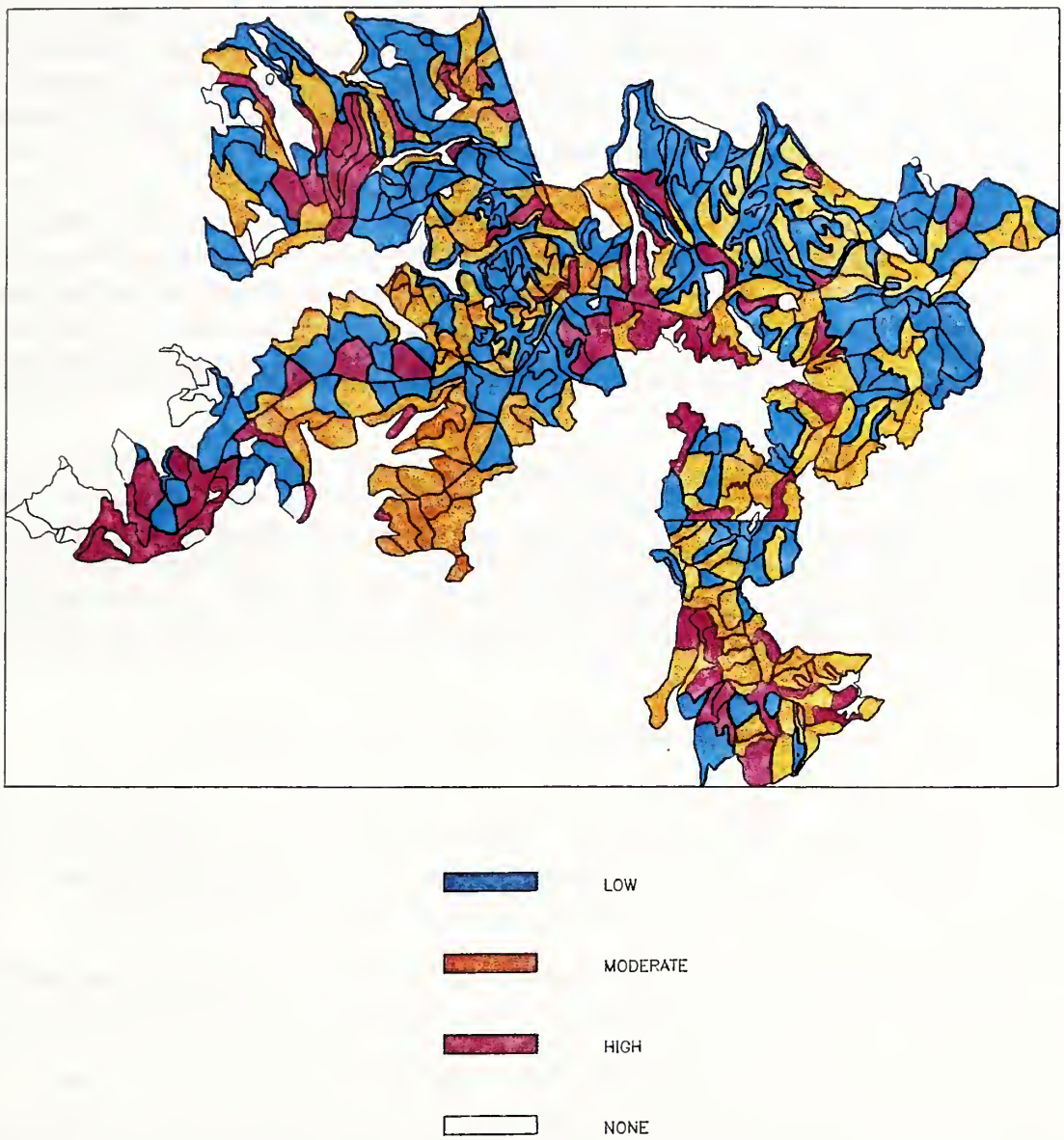
**Low-** Infections occur in pockets, generally less than 1/4 acre in size with intensities varying from light to moderate.

**Figure 3**



While infection rates typically are in the 30-60% range, the infection rate in Pocket/Baker is nearly 90%. The higher infection rates along the Mogollon Rim are suspected to be associated with its proximity to the Rim (combination of high light intensity and high relative humidity), in combination with fire suppression and logging done under various modifications of the selection harvest system (85).

**MAP 3: DWARF MISTLETOE INFECTION SITES**



## Dwarf Mistletoe and Spread

Elements of stand dynamics that affect the rate of spread are site quality and host vigor, stand density, stand age and size structure, stand composition, and stand history. The number of trees infected, the intensity of infection, and the degree of damage consistently increase with the age of trees or stands (Baranyay 1970, Childs 1963, Graham 1960, 1964, Hadfield 1977, Hawksworth 1958, 1961, Hawksworth and Graham 1963, Hawksworth and Hinds 1964, Muir 1972, Scharpf 1969, and Stewart 1976).

Dwarf mistletoe spreads by explosively released seeds which are expelled to distances ranging from 10 to 40 feet. Spread of dwarf mistletoe is a function of stand density, age, and site index, and averages one or two feet per year. Spread is most efficient and rapid from an infected overstory to an understory and slowest through a dense even-aged stand. The rate of spread through two or more storied stands is more rapid than through single-storied stands. The vertical spread in ponderosa pine is about 4 inches per year (Graham 1967, Hawksworth and Geils 1985).

In stands with infected overstory trees, the upper crowns of understory trees can rarely remain free of increasing mistletoe inoculations, and reductions in growth with further increase in mistletoe infection is almost certain. Generally, no significant effect on height or diameter growth occurs until mistletoe reaches the upper half of the tree crown (Hawksworth and Geils 1985). Spread into the upper half of the crown, in absence of overstory infection sources, can be delayed as long as the rate of leader growth exceeds the rate of upward spread.

Paul (personal communication 1995) noted isolated pockets of dwarf mistletoe infection in the Mingus Mountains (south of Jerome, Arizona) with apparent infection sources as much as 1/2 mile away, and speculated that birds are probably the likely carrier and infection source. Hawksworth and Wiens (1995) indicated from reviewing previous studies that actual numbers of satellite infection centers caused by birds are relatively low, yet birds are important in the spread of dwarf mistletoe. He also concluded that mammals (squirrels, porcupines) are less likely to contribute to the significant spread of dwarf mistletoe.

## Dwarf Mistletoe Effects on Ponderosa Pine Growth

As parasites, dwarf mistletoes cause significant changes in physiological processes and structural characteristics of infected trees which result in changes in the structure and function of forest communities (Parmeter 1978, Tinnin 1984). Infected host trees are slowly weakened and eventually killed as the dwarf mistletoes drain them of water and nutrients (Tochner and others 1984).

It has been well documented that heavy infections of dwarf mistletoe markedly reduce the growth rate in ponderosa pine. On ponderosa pine lands in south-central Oregon, Shea and Belluschi (1965) studied growth differences between lightly and severely infected (severely meaning dwarf mistletoe throughout the crown), and suggest that immature ponderosa pine is greatly impacted by severe dwarf mistletoe infections. They found a growth rate of severely infected trees was nearly half that of lightly infected trees. The Shea and Belluschi study supports Hawksworth's (1961) findings that there is a significant reduction of growth (based on recent radial increment) in DMR classes 5 and 6. He also found that infected trees with witches' brooms had even greater growth loss than those infected but not showing broominess. Hawksworth could not detect a significant growth difference between lightly infected and uninfected trees. Pearson (1950) and Pearson and Wadsworth (1941) noted the effects of dwarf

mistletoe on board-foot increment over a 30-year period in a ponderosa pine stand in Northern Arizona, and found that heavily infected trees produced 35 percent less than the uninfected trees.

Childs and Edgren (1967) demonstrated the importance of height growth as a factor in volume-growth, concluding that theoretical calculations show the impact on volume growth from heavy infections will be underestimated by about 40% if the impact on height growth is ignored. They concluded that the stunting appearances in heavy infections give the site a poorer indication than it really is.

### Dwarf Mistletoe and Ponderosa Pine Mortality

Survival of dwarf mistletoe is influenced by the severity of dwarf mistletoe infection. Hawksworth and Geils (1990) determined 32-year survival rates of tagged ponderosa pines with various intensities of dwarf mistletoe at Grand Canyon National Park, Arizona. While more than 90% of the uninfected and lightly infected trees survived the 32 year period, only 5% of the heavily infected trees over 9 inches diameter and none of those in the 4-9 inch class survived. After 32 years, the average rating of trees initially rated as moderate increased to a severe class, regardless of initial tree diameter.

The mean longevity or length of time in which half of the trees are expected to die, by dwarf mistletoe rating class and tree size from Hawksworth's and Geil's study is reprinted below:

**Table 14:**
**Mean Longevity of Pines Infected With DM**

| DMR Infection Class | Trees Under 9 Inch DBH | Trees 9 Inch DBH or Over |
|---|---|---|
| | ----------years---------- | |
| 0-1 | * | * |
| 2-3 | 30 | 57** |
| 4-5 | 17 | 25 |
| 6 | 7 | 10 |

* Too minor to be determined from study.
** Extrapolated estimates by Hawksworth and Geils.

### Dwarf Mistletoe in Saplings and Small Poles

Within heavily infected stands cut for regeneration, removal of infected seed trees over established seedlings must occur before the seedlings are 0.9 meters tall (Johnson and Hawksworth 1985) or approximately 10 years old. However, Mathiasen and others (1990) determined that Douglas-fir regeneration could be 20 years old or less than 1.4 meters tall. Small trees do not present much of a target to seed dispersal.

Barrett and Roth (1985) concluded that dwarf mistletoe in saplings and small poles (40-70 years old) could be tolerated through a rotation if stands could be maintained to grow 10 inches or more in height each year. Initial basal areas on their study plots were less than 50.

The percent survival after 11, 20, and 32 years of ponderosa pine by dwarf mistletoe rating class and tree size from Hawksworth and Geil's study is reprinted below:

**Table 15:**
**Survival of Trees Infected With DM**

| DMR Infection Class | Trees Under 9 Inches DBH | | |
|---|---|---|---|
| | 11 yrs | 20 yrs | 32 yrs |
| 0-1 | 99% | 97% | 90% |
| 2-3 | 90% | 81% | 43% |
| 4-5 | 60% | 40% | 13% |
| 6 | 16% | 16% | 0% |

| DMR Infection Class | Trees 9 Inches DBH and Over | | |
|---|---|---|---|
| | 11 yrs | 20 yrs | 32 yrs |
| 0-1 | 98% | 98% | 97% |
| 2-3 | 91% | 90% | 83% |
| 4-5 | 82% | 63% | 33% |
| 6 | 48% | 36% | 5% |

It is very apparent that younger and/or smaller trees are impacted greater than the older and/or larger trees. Regardless of tree size however, trees in the moderate to heavy infection level (4+) only have a 1 in 3 chance at best of survival.

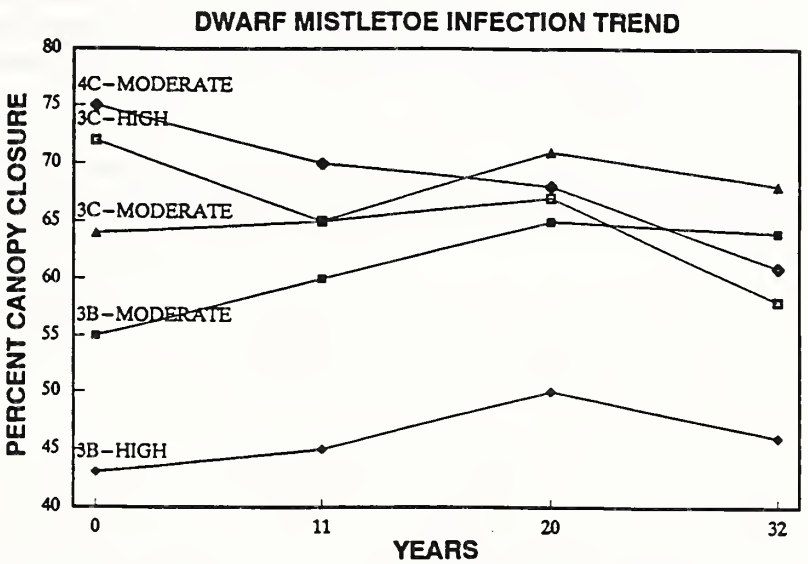
The most striking summary of these tables is that less than 1/2 of all small trees (9 inch DBH and under) infected at the light to moderate level currently died within 32 years. This has significant impacts to future canopy and vegetative structure. Young stands currently heavily infected with mistletoe will be very open. Trees maintained at relatively light infections will have little impact on future vegetative structure.

## Dwarf Mistletoe and Ponderosa Pine Canopy

The results of the Hawksworth and Geils study were applied to representative stands within the Pocket/Baker 20K (123). Most of the canopy closures will remain at or above 40% where that condition currently occurs for approximately the next 50 years. Then, there will be a rapid decline of canopy closure as basal areas fall dramatically due to the high percentage of trees with mistletoe ratings of 4 or greater that succumb. In regards to canopy closure sustainability, the greater the number of ponderosa pines 12 inches and under (blackjacks) with high mistletoe infections, the shorter the time frame that a stand will maintain a "B" or better (40%+) canopy. Also, the greater the number of ponderosa pines with a DM rating of 4 or higher, the shorter the time frame that a stand will maintain a "B" or better canopy. Lower stand densities (circa 100 basal area) appear to increase in canopy closures longer, because the decade growth rates associated with lower densities (minimum site competition) are much higher and able to offset longer the negative growth effects of dwarf mistletoe. Figure 4 displays the trend of DM infection for several representative stands in Pocket/Baker for the next 32 years.

Sites in the Pocket/Baker area are probably better than the ones where the mistletoe study took place. Topoedaphic factors and soil types (reflected in site index) are local factors that mitigate the length of time tree mortality is expected. Therefore, there may be a greater window of opportunity for treatment of mistletoe on good sites, while there will be a shorter window of opportunity on poorer sites (123).

**Figure 4**




3C-MODERATE MEANS: VSS 3, C CANOPY, MODERATE MISTLE INFECTION
(SEE PR DOC#189)

**Dwarf Mistletoe and Logging**

Past cutting practices that have modified vigor, density, age, structure, and composition of stands have influenced mistletoe activity. Depending on levels of infection and existing age classes, treating mistletoe may have various levels of success.

The key to reducing dwarf mistletoe is the removal of as much of the infected trees as possible. Lightle and Hawksworth (1973) reported drastic reductions in dwarf mistletoe infestation 20 years after original treatments, up to 35 times less infection than untreated sites. Their original treatments, however, included pruning, the removal of infected branches if it resulted in less than half the crown being removed; otherwise, trees were killed. Results from the Tusayan Ranger District (Kaibab National Forest) (USDA 1995a) on a project that girdled and poisoned infected trees in 1981 indicate a current dwarf mistletoe infection that is very low. Though the kill success was nearly 100 percent, all but 5% of the total trees have since fallen to the ground. While normal snag fall rates are around 1.5% per year (Menasco 1983), the killed trees had a fall rate of 9% indicating the relatively short period the girdled trees functioned as snags.

Noting the difficulties of controlling the spread and intensification with infected overstory trees in all-age stand conditions, Merril and others (1988) evaluated the effectiveness of dwarf mistletoe suppression in unevenage stands on the Flathead Indian Reservation. The thinning-sanitation procedure was used in trees with infections on up to 1/3 of the stem (which corresponds generally to the District's light infection rating, or 1-2 on Hawksworth's six point scale). The procedure was to remove all visibly infected trees, while the evenage treatments of clearcutting and seed tree harvest would occur in severely infested stands. They concluded that the thinning-sanitation treatment was ineffective due to the inability to recognize the latent (or hidden) infection sources. They concluded, as did other studies (Hawksworth 1978, Knutson and Tinnin 1980), that significant amounts of mistletoe will occur 5 years after the original treatment due to latent infection.

Heidman (1983) concluded from a long-term study that the complete removal of infected overstory and understory is the only effective silvicultural method of controlling dwarf mistletoe in mature stands of southwest ponderosa pine. His study was done in a virgin stand with an infection rate of 45%.

Barrett and Roth (1985) concluded that dwarf mistletoe in saplings and small poles (40-70 years old) could be tolerated through a rotation if stands could be maintained to grow 10 inches or more in height each year. Initial basal areas on their study plots were less than 50.

With regards to the Mexican spotted owl, application of unevenage in moderate infection levels is not likely to meet the desired residual density levels for nesting/roosting habitat (138). This is because infections in moderate stands occur frequently throughout such sites and generally in large pockets often exceeding an acre. Individual tree or group selection does not adequately deal with such pockets, and trees identified as excess by the application of the Q factor are not the proper mixture of size classes to meet the retention parameters (136). The net result is that unevenage structure is not attainable in moderate infection level stands.

Unevenage treatments in low DM sites are not a problem, because most infected trees are scattered enough both spatially and across the age classes. Treatments in high DM sites is generally a seed cut which is not an unevenage treatment.

The Pocket/Baker ecosystem has approximately 12,000 acres of moderate and high level dwarf mistletoe sites. Projections on survival (see above) indicate that current high level sites will be severely impacted in about 60 years. Generally, treatment of stands that are heavily infected consists of regeneration harvesting (seedcut), and then remove (or kill) the infected overstory seed source when the stand becomes established. Ideally, the earlier that a highly infected stand is treated the greater the chance for relatively mistletoe-free seed sources. Preventing moderate level infections from reaching high is one way to reduce the amount of sites that will be in regeneration status. Therefore, treatment of stands that are currently at the moderate level will certainly decrease the amount of future seed cutting and significantly reduce the impacts from future large acreages in the seedling/sapling vegetative stage.

It takes approximately 50 years before a regenerated stand grows into a vegetative stand structure class (VSS3). An approach that treats all highly infected sites at once will create the open and seedling/sapling (VSS 1/2) structures for many years. The cumulative effect of delaying treatments in the more highly infected stands is that there is a greater amount of any one VSS group that moves through the landscape in a particular condition, especially at the younger age classes which are typically not in short supply. This simplification of the landscape gets worse the longer the delay. The greater the simplification of the landscape to seedling and saplings, the greater the time lag before stand structure is available for dense and multi-structure habitat. Moir and Mowrer (1993), in defining healthy ecosystems, caution against such time lags.

### Dwarf Mistletoe and Old Growth

In the cases of high mistletoe rating in stands designated as old growth or developing old growth, the standard treatment of removing the infected overstory most likely will result in other species (juniper, Gambel oak, manzanita, etc.) invading, with limited ponderosa pine regeneration. Thus old growth conditions may not be achievable for well over 200 years. On a field trip in 1992 with Arizona Game and Fish personnel Rick Miller and John Goodwin, team members concluded that sites designated as developing old growth with highly infected mistletoe would be best left designated as developing old-growth with no planned harvest treatment (164). Untreated, the mistletoe will stagnate the site, and the site would not develop into old-growth. However, it will function as old-growth, or at least close to an old-growth condition for a time period.

### Dwarf Mistletoe and Wildlife

Dwarf mistletoes are parasitic, seed-bearing plants that depend on their hosts almost completely for water and nutrients. Dwarf mistletoes are natural components of many forest ecosystems. Mistletoe berries have been found in 20,000 year-old packrat middens (Bennetts 1991). Mistletoes provide forage for many species of birds and mammals, and the limb structures (witches brooms) resulting from severe infections provide excellent nest sites. In a study in central Colorado Bennetts (1991) found the abundance and richness of birds to be enhanced by dwarf mistletoe.

Hawksworth and Wiens (1995) summarized the relationships between dwarf mistletoe and wildlife. Various mammals utilize dwarf mistletoe as food, but none are dependent entirely, or primarily, dependent on this food source. Except for possibly the blue grouse, the use of dwarf mistletoe as a food source is minor. Witches'-brooms cause by the dwarf mistletoe are frequently used by birds and squirrels as nesting sites. Mistletoe also makes up significant portions of the diets for porcupines, and during some seasons of the year in squirrels also. Although dwarf mistletoe has been shown to have a high nutritive value, the plants are usually out of reach for deer and elk. Fleishman (personal communication) has often seen elk feeding on mistletoe shoots in green ponderosa pine logging slash on the Long Valley District.

**Dwarf Mistletoe and Fire**

Harrington and Hawksworth (1990) note that little quantitative information is available for natural mistletoe control by fire in ponderosa pine. They note that prescribed understory burning in a study in Oregon indicated that dwarf mistletoe could be partially sanitized in both thinned and unthinned pine stands in even-aged immature stands. They evaluated the interactions of fire and dwarf mistletoe on mortality of ponderosa pine following prescribed burning. They found that infected trees suffered more crown scorch than healthy trees because they had flammable witche's brooms and lower crowns. Heavily infected trees had less than half the probability of survival. They noted that the most promising opportunity for using fire for mistletoe control appears to be in heavily infected stands where patch clearcutting would be followed by intense broadcast burning. They noted that understory burning will have a partial sanitizing effect on light and moderately infected stands. They also noted that applying prescribed fire to attain specified levels of crown scorch is difficult.

Frequent fires prior to European settlement probably reduced dwarf mistletoe in many areas (Parmeter 1978).

## SUMMARY OF DISTURBANCE ELEMENTS WITHIN POCKET/BAKER

### Summary of the Fire Element

(Interactions of fire with other landscape elements is displayed and summarized in Chapter 5.)

- The fire frequency in ponderosa pine prior to European settlement was approximately every 5 years; in mixed conifer it was approximately every 22 years.

- Pine systems with a natural fire cycles have unevenaged stand structures composed of small, relatively evenaged groups. Pine systems with fire exclusion tend to result in thickets of regeneration which stagnate and reduced vigor and growth in trees.

### Summary of the Dwarf Mistletoe Element

- The infection rate of dwarf mistletoe in Pocket/Baker is 90%, two to three times the Coconino National Forest average. This level of infestation will alter tree vigor and mortality affecting pine growth and consequently tree structure, density, and canopy. The greatest potential impact is to the habitat of the Mexican spotted owl and other species relying on old growth and/or dense stand conditions.

- Infection levels increase about one level every 10-15 years. Seedlings/saplings lightly infected will be highly infected within about 70 years.

- Trees less than 9 inches in diameter or stands where the VSS is 3 or less are highly susceptible to the effects of dwarf mistletoe. Studies suggest that these trees or stands currently at moderate or high levels of infestation will rapidly decline in vigor and potential to reach dense canopy or old growth conditions within the next 30-60 years.

- Trees greater than 9 inches in diameter or stands where the VSS is 4 or greater are less susceptible to the effects of dwarf mistletoe. However, management options for attaining desired vegetative structures will be limited at the time of regenerating the stand.

- The greater the infection level the fewer the options for vegetative stand structures that are attainable. Moderate to high infection levels preclude management for quality unevenage or dense canopy structures.

- Birds and other wildlife benefit from dwarf mistletoe. The level of infestation and/or acreage at which wildlife is impacted negatively or positively is unknown.

# CHAPTER 7 - LINKAGES

This chapter describes the existing condition in terms of:

- linkages to landscapes outside of the Pocket/Baker ecosystem

Linkages between the Pocket/Baker ecosystem and the surrounding landscape occur in various ways: water, air, birds, elk/deer, and people. People interact with the adjacent West Clear Creek Wilderness. These are the same as the flows that were described in Chapter 4. Flow descriptions in that section focused on dynamics WITHIN the Pocket/Baker ecosystem. The descriptions for this section focuses on dynamics BETWEEN the Pocket/Baker and the surrounding landscapes.

## WATER

Though no perennial streams exists within the Pocket/Baker ecosystem area, seasonal runoff does contribute to the water content of four major stream courses: West Clear Creek, East Clear Creek, Verde River, and Fossil Creek. Water quality is measured not within the Pocket/Baker ecosystem, but at locations of the 5th code watersheds containing the aforementioned stream courses.

Within each of the 5th code watersheds, water quality is monitored by ADEQ. The Arizona Department of Environmental Quality (ADEQ) acquired the following water quality data in 1992 from water quality monitoring the following streams:

1) East Verde River: non-support
2) Pine Creek (East Verde Watershed): non-support
3) Fossil Creek: partial support
4) West Clear Creek: full support
5) Little Colorado River (East Clear Creek): non-support

The 1992 assessments are based on Arizona's water quality standards. Assessment of designated use support is categorized as 1) full support, 2) threatened support, 3) partial support and 4) non-support, depending of the frequency that standards were exceeded and on the toxic impact of the parameter. Note that all of the streams surveyed are outside of the Pocket/Baker ecosystem area; however only one is in full support of ADEQ water quality guidelines.

## LITTLE COLORADO SPINEDACE

The Little Colorado spinedace (Lepidomeda vittata) is Federally listed as a threatened species under the Endangered Species Act of 1973. This species of fish is endemic to the Little Colorado River basin (Miller 1963). East Clear Creek is one of three drainages within the basin which has been identified as containing critical habitat for this species. The U.S. Fish and Wildlife Service restricts the critical habitat designation to include only the stream course (Final Rule 1987). The spinedace utilizes clean, permanent flowing water, with pools and a fine gravel or silt-mud substrate.

The portion of East Clear Creek influenced by the Pocket/Baker 20K ecosystem is that which extends from Blue Ridge Reservoir upstream to the headwaters near Potato Lake. The headwater drainages include Potato Lake Draw; which is characterized by intermittent flows. The northeastern edge of the 20K (Location 687) borders approximately one-half mile of Potato Lake Draw, and includes approximately 300 acres of the Potato Lake Draw watershed.

The occurrence of the Little Colorado spinedace has been recorded at Jones Crossing (Minckley 1984, Nisselson and Blinn 1989) which is approximately ten miles downstream from the 20K's area of influence. More recently, spinedace have been found in East Clear Creek near the confluence with Poverty Draw (per. comm. Cain 1993) which is approximately three and one-half miles downstream from the 20K's area of influence.

## AIR

A 1992 Oregon Air Quality Report shows that Central Oregon and Northern Arizona, including the Pocket/Baker area, have the two worst atmospheric ventilation conditions in the country (ODEQ 1992).

## BIRDS

Neotropical migratory birds spend summers in the Pocket/Baker area, though some species that appear on various neotropical bird lists winter either in the vicinity of Pocket/Baker or within the State of Arizona. The Pocket/Baker area represents a portion of their overall habitat. Some individuals choose to stay within the Pocket/Baker area, while others utilize the habitat more as a flyway or short layover to other locations.

Seasonal movement patterns of Mexican spotted owls are variable. Limited available evidence on wintering habitat suggests that the bulk of the owl population is nonmigratory (USDI 1995). Wiley (1993) made a general conclusion that migrating owls move to more open habitats at lower elevations. Knowledge of habitat use by either adults or juveniles for dispersal is also very limited (USDI 1995), but the MSO Recovery Plan states that existing levels of connectivity for MSO in this recovery unit should be maintained.

Three peregrine nesting sites (eyries) exist within close proximity to the Pocket/Baker area. All three are located on the Tonto National Forest, immediately below the Mogollon Rim. Given the close proximity of the known eyries, and the distance at which peregrine forage from their nest sites, there is a high probability that the Pocket/Baker ecosystem provides foraging opportunities for peregrine falcon.

The nearest suspected northern goshawk nesting site is called Lee Johnson (040406) and is located approximately 1 mile to the east of the analysis area boundary. Juvenile goshawks were discovered in this area in 1992 and remained in the area for at least a week afterwards. Nest searches failed to located the nest where these birds fledged from, but four unoccupied stick nests of unknown origin were located in the vicinity. Since no active nests were located either in 1992 or 1993 and the juveniles were located so late in the summer (and thus could be several miles away from their nest), no fledgling portion of a management territory has been established. Based on the location of the juveniles and the four inactive nests, it is possible that some of the Baker 10K would be included within a potential foraging area. There are no other established goshawk territories or nesting areas in the vicinity of the Pocket/Baker analysis area.

## ELK/DEER

The entire analysis area is used primarily as summer range, and most elk and deer move to lower terrain during the winter. Numerous travel corridors exist for major wildlife movements.

## LIVESTOCK

The Baker Lake and Calf Pen grazing allotments are a portion of the summer range for the Pine and Hog Canyon allotments of the Tonto National Forest.

## PEOPLE

Most of the visitors in 1992-93 recreating in the Pocket/Baker ecosystem were from the Phoenix metropolitan area, while less than 10% of the people were from the Verde Valley (73).

## FOSSIL SPRINGS WILDERNESS

Fossil Springs Wilderness (10,477 acres) scenic feature adjacent to the Pocket/Baker study area (though a few canyons and a point totalling about 1350 acres are within Pocket/Baker). From the western edges of Pocket/Baker the Fossil Springs Wilderness extends eastward for about 8 miles down a canyon of steep cliffs and rugged terrain. The portions of the wilderness within the Pocket/Baker study area consist mostly of sharp canyons that cut into the plateau above. Pocket Point (633 acres) is the only portion of the wilderness within the Pocket/Baker boundary that is not a canyon (see map below).

Pocket point does not serve as an access point into the rest of the wilderness, and is a relatively unused (by recreationists) area of the wilderness. There are no designated trails that access the wilderness, and there are no recreation use figures available for this wilderness. Of the eleven wilderness areas within the Coconino National Forest, there are use figures available for only one (Hendee and others 1990). An informal sample of use is also available for West Clear Creek.

**Recreational Wilderness Impacts**

The objectives of the Wilderness Act to maintain a natural setting and to maintain the wilderness experience seems contrary to allowing recreational use of a relatively pristine area. Recreational use itself is a threat to a natural setting.

Visitors often see wilderness problems differently than managers (Hendee and others 1990). Washburne and Cole (1983) reported that wilderness managers considered human impacts on campsite vegetation to be the most serious problem, followed by lakeshore vegetation trampling, littering, and other trampling impacts. Included in the serious problems was the disposal of human feces. Visitors, however, had more concerns with social conditions like crowding, conflict among visitors, and strong concerns with littering, than with resource conditions such as campsite and trail impacts (Lucas 1979; Shindler and Shelby 1992). Lucas (1990) found that firerings have little affect on campsite acceptability.

**Indicators of Wilderness Quality**

Human use is part of the wilderness mandate, and realizing that humans create impacts, the Wilderness Act allows a limited amount of change from the pristine. The challenge is in deciding how much change is acceptable. Stankey and others (1985) developed the limits of acceptable change (LAC) framework for wilderness impacts. The framework utilizes indicators to define wilderness quality. The best indicators are those that reflect the degree of naturalness of the wilderness ecosystem and the quality of the wilderness experience. The LAC process establishes acceptable levels or standards for the indicators. However, Wilderness Act terms such as solitude, untrammeled, and primitive are subject to value judgements. Therefore, the views of the wilderness clientele are critically important (Roggenbuck and others 1993).

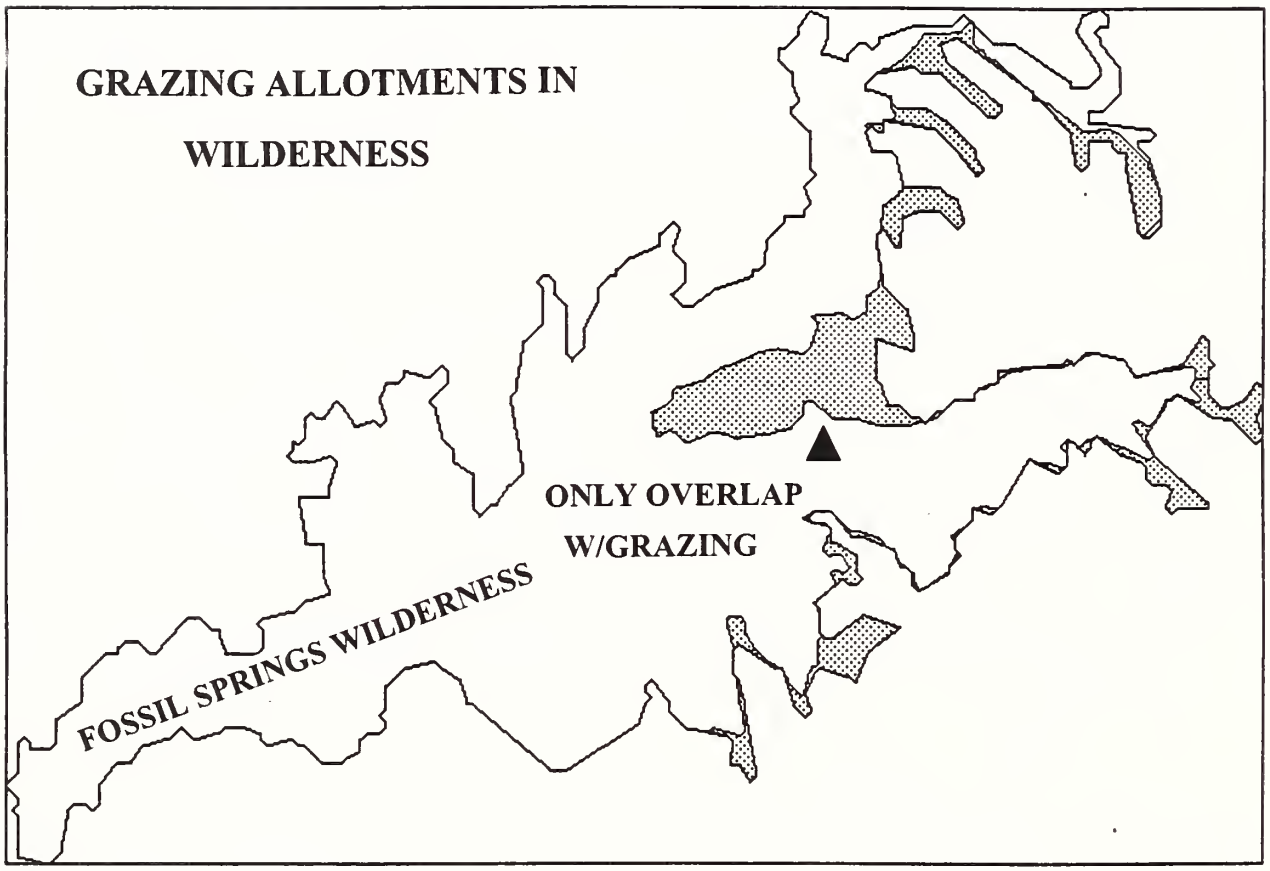
An LAC analysis has not yet been done for Fossil Springs Wilderness. Such an analysis is beyond the scope of this document.

**Wilderness and Livestock Grazing**

The boundaries of the Calf Pen and Baker Lake grazing allotments overlap the Fossil Springs Wilderness on about 1350 acres within three pastures. Approximately 630 acres of the Calf Pen allotment lies within the Fossil Springs Wilderness at Pocket Point (see Map 4) and is grazed every other year. Cattle cannot venture further into the wilderness due to the steep canyon walls that drop off at the edges of Pocket Point. The allotment was being grazed prior to the area being designated as wilderness. There is also an existing tank on Pocket Point (in the wilderness) and a jeep trail leading to it. The trail, however, is currently not driveable. The tank has been partially silted in and has not been maintained in a number of years.

The remaining 720 acres of the wilderness within Pocket/Baker is not grazed by livestock because cattle do not have access to the steep canyons.

**MAP 4:**
**GRAZING ALLOTMENTS AND WILDERNESS**



# CHAPTER 3 - ENVIRONMENTAL CONSEQUENCES

This chapter describes the:

- effects of implementation of each alternative
- comparison of alternatives by major issues
- mitigation

Short Term vs. Long Term

**Short term** effects are analyzed generally over a ten year period, the estimated time before a new ecosystem analysis will occur within Pocket/Baker. **Long term** effects go beyond 10 years when management direction now sets a trend for the future.

## ISSUE #1: Absence of Fire in the Ecosystem

### SCOPE OF ANALYSIS

Resolution of this issue requires analysis of the historic role of fire and its effects on soil productivity, vegetation species and diversity, and wildlife habitat. Prescriptions, based on past experiences and research, limit undesirable effects.

With the implementation of the MSO Recovery Plan, some terminology from past management direction has changed. One of those changes is the use of protected activity centers (PACS) instead of management territories. Though this document still refers to management territories in many cases, the territories have been adjusted to conform to PAC standards; therefore, for the purpose of this analysis, the terms are interchangeable.

### CONSEQUENCES IN THE PONDEROSA PINE COMMUNITY

#### Alternatives 1, 2, 3, 6

Approximately 4300 acres of heavy forest litter loads, and 10,000 acres of underburning for forb/grass stimulation will occur. The net effect is a reduction in the intensity and number of wildfires, because more of the Pocket/Baker area will have fuel loads ranging from 6-14 tons per acre.

The prescription for burning will set a maximum soil heating temperature at approximately 600 degrees Fahrenheit. This will not significantly affect soil productivity because organics are not excessively

consumed, soil structure is not altered, soil porosity is not reduced, and the presence of microorganisms is not destroyed.

The retention of 5-10 tons of coarse woody debris will retain soil productivity. Vigor and growth will increase for all vegetative species, particularly fire adapted species like oak, members of the rose family, ceanothus, and aspen. There will be a greater diversity of grass and forb species. There will be a greater abundance of grasses, particularly bottlebrush squirreltail.

The proposal to repeat burn every 4-10 years will maintain high levels of nitrogen which in turn will add nutritive value and vigor to plants.

Burning will reduce the amount of established pine seedlings, providing some relief from overstocking in very small tree components. Burning will also reduce the amount of dwarf mistletoe infection, though the quantity is undetermined and highly dependent on the intensity of the burn and site and tree conditions.

Where burns torch out small patches of trees, vegetative structure will be enhanced by seedbeds for seedlings that will provide future unevenage structure.

Past experience with snags protected (by removing duff and woody debris from the base, or through lighting techniques) indicates that some snags are still burned. The net effect is that some snags will be lost, while others are created from green trees. Some wildlife cover, particularly hiding cover, may be lost where burns reduce seedlings, saplings and underbrush.

Patton and Gordon (1995) report the beneficial and detrimental effects that fire has on plant and animal species. Generally, insect populations increase following a fire, and in response, the quantity and diversity of insectivorous bird species also increases. Populations of small mammals such as rodents, typically decrease immediately following a fire due to direct mortality from the fire or indirectly from a loss of cover and starvation. Depending on the severity and extent of the fire, small mammal populations may increase to levels higher than pre-fire levels. This would be due to the increase in quality and quantity of herbaceous vegetation following a fire and the animals high reproductive rates.

Patton and Gordon (1995) list turkey as being both a fire-adapted and fire-dependent species. "Fire-adapted species are associated with habitat that is characterized by recurring fires of various intensities." These species "use both dense canopy areas and openings...". Therefore, fire created small opening within forested areas could provide a desirable mixture of feeding areas within close proximity to cover areas for turkey. "Fire-dependent species are associated with fire-dependent and fire-adapted plant communities." Given that the ponderosa pine type is both a fire-adapted and fire-dependent vegetative community, the use and reintroduction of fire into the 20K is likely to improve/enhance turkey habitat (provided other habitat elements are present - roosts, water, cover).

The hazard reduction burns and prescribed burns could cause a direct effect to Abert squirrels through heat and/or smoke produced from the burns. The mobility, and ability to travel through the tree canopy, may reduce susceptibility to the direct effects. Indirect effects would be through the loss of nesting structures and loss of food items such as mushrooms and truffles (depending on the intensity of the burn).

The proposed burning, whether hazard reduction or prescribed burning, is expected to increase the amount of available forage for deer and elk. Severson and Medina (1983) indicate that the accumulation of litter and duff can result in a decrease in herbaceous understory. They also state that fire in the

ponderosa pine type benefits deer and elk through the reduction of competing trees, amount of litter, and depth of the duff layer with the resultant effect of increased understory vegetation.

The prescribe fires should not have any direct effect on goshawks since the fires are usually low intensity, "cool" burns which don't kill many trees. Mortality generally occurs in small patches well spread over the landscape as hot pockets of fire torch out groups of trees. In terms of goshawk and Mexican spotted owl prey species, small mammal populations may temporarily decrease following a fire, but there should be an increase in avian prey species. Over time, the small mammal populations should increase and may exceed pre-burn populations which could benefit foraging goshawks, peregrines, and Mexican spotted owls.

The MSO Recovery Team encourages the increased use of fire to reduce fuel loads and the probability of catastrophic, stand-replacing, crown fire. However, they stress burning prescriptions which would maintain key structural features (large trees, snags, hardwood understory, and logs) for MSO and small mammal habitat (USDI 1995).

Fuel loading within the 20K is proposed to be treated with three different methods, they are: crushing, broadcast burning, and pile burning. Select sites along the edge of the Mogollon Rim contain old machine piles. Burning these piles would present a risk of fire spreading below the Rim. Therefore, these piles are planned to be "crushed". More appropriately, the crushing would actually result in the spreading of piled slash. Heavy fuel loadings in other areas are proposed to receive broadcast burning. These burns will probably occur in two stages during higher fuel moisture conditions so as to reduce the loading without excessive tree loss. The majority of the 20K is proposed for a broadcast burn which reduces lower accumulations of slash and duff layers. This broadcast burning is prioritized (high, moderate, and low) based on the need for treatment.

Crushing of the old piles would likely destroy habitat currently occupied by small mammals; but because the material is being retained on site, reoccupancy of the slash by small mammals is also likely. The broadcast burning would reduce down woody material; and therefore, would eliminate a certain amount of the small mammal's hiding and nesting cover. However, not all material would be burnt, and the fire effects are expected to produce an increase in herbaceous vegetation which would benefit small mammals. The existing piles proposed for burning have provided artificial structures for small mammals. The loss of these piles would certainly displace the rodents which occupy them. Site 674/2 is the only area within any of the six PAC's proposed for prescribed/broadcast burning.

General mitigation for minimizing effects to Mexican spotted owls (Letter to Region 3 National Forests, March 22, 1993) is to burn no more than 25% of a protected activity center (then referred to as a management territory) in any one year and let the site recover for two more years prior to burning again. At this rate, an entire MSO PAC may be prescribed for burning within 10 years. Figure 7 indicates the percent of each management territory scheduled for prescribed fire. This indicates that all but one management territory will have less than 25% of the territory burned. Management territory #040421 has less than 25% of the highest priority burn (reducing hazardous fuel loading). The high priority portion will more than likely be accomplished in the first year of burning. Subsequent burns (after appropriate rest periods) will accomplish the remaining acres.

Burning prescriptions meet the Recovery Plan's intent to reduce the risk of wildfire, while at the same time preserving the key elements of the Mexican spotted owl (large trees, snags, hardwood understory, and logs) for MSO and small mammal habitat.

### Alternatives 4, 5

Existing high fuel loadings coupled with increasingly dense pine vegetation conditions will increase the risk for catastrophic fire, particularly along and on top of the Mogollon Rim. Wildfires will tend towards higher intensity and longer duration. They will be more erratic, and more costly to suppress. Greater resource damage will occur from fire fighting efforts, and directly from fire effects (soil sterilization, property destruction, water quality degradation, threatened and endangered species habitat destroyed). As an example, the Huffer Fire (1976) adjacent to the Pocket/Baker completely destroyed the pine vegetation over 1200 acres on relatively gentle slopes. Both the Dude and Bray fires (1990) did significant damage to the vegetation on top of the Mogollon Rim where dense conditions, or heavy fuel loading existed. Fire dependent species will continue to decline.

## CONSEQUENCES IN THE PINYON-JUNIPER COMMUNITY

### Alternatives 1, 2, 3, 6

Approximately 200 acres of pinyon-juniper grassland will be burned. The general effects to soils and plants are the same as for ponderosa pine community. Ground cover is enhanced by reduction of alligator juniper which promotes soil productivity with less erosion and greater organic buildup. In localized places where the burn exceeds prescriptions, there will be short term negative effects to soils as heat intensity affects soil structure.

### Alternatives 4, 5

Junipers will continue to invade the grassland reducing ground cover and soil productivity.

## CONSEQUENCES IN THE MIXED CONIFER COMMUNITY

### Alternatives 1, 2, 3, 6

Approximately 700 acres of mixed conifer sites will be broadcast burned. In the drier fringes of those sites dominated by ponderosa pine, there will be a slight reduction in the amount of mixed conifer trees, particularly seedlings and saplings, thus reducing the movement of mixed conifer species into the ecotone between pine and fir. Retention of 10-15 tons per acre of coarse woody debris will retain soil productivity.

### Alternatives 4, 5

Unless wildfire occurs, the mixed conifer sites and inclusions will continue succession into the ponderosa pine community. This will increase habitat for mixed conifer dwelling species.

## CONSEQUENCES FOR ADJACENT COMMUNITIES

### Alternatives 1, 2, 3, 6

With the proposed fuels reductions and reintroduction of fire, the threat of wildfire will be reduced, which consequently reduces the threat to the communities of Pine and Strawberry. The Mogollon Rim above the two communities will be easier to defend from fires which begin in the Pine-Strawberry areas. Fire management strategies will be increased to better utilize the appropriate suppression response.

While reduced threats from wildfires reduces impacts to air quality, the prescribed fire activities will contribute to poor air quality for short durations.

Anticipated changes in particulate standards by 1997 will result in smaller blocks being burned and possibly time and/or cost intensive methods of limiting particulate matter from being emitted. Burning smaller blocks will reduce the amount and duration of smoke, and allow faster suppression if weather patterns shift to unacceptable conditions.

### Alternatives 4, 5

The threat of catastrophic fire continues. With increasing settlement in the Pine-Strawberry area, there is an increasing chance that wildfire will occur below the rim and into the Pocket/Baker area.

## COMPARISONS, CONCLUSIONS, AND MITIGATION (Issue #1)

### Comparison of Alternatives

The following lists the units of measure that were selected to measure attainment of project objectives and resolution of issue #1.

a. Amount of area that will be prescribed with broadcast burns.
**Measure:** Acres of broadcast burn (Figure 5).

b.The amount of area that is in the desired 6-9 tons per acre range (pine type).
**Measure:** Acres of forest litter loadings ten years into the future (Figure 6).

c. The amount of burning in each MSO PAC.
**Measure:** Acres of burning in each PAC (management territory) (Figure 7).

**Figure 5**

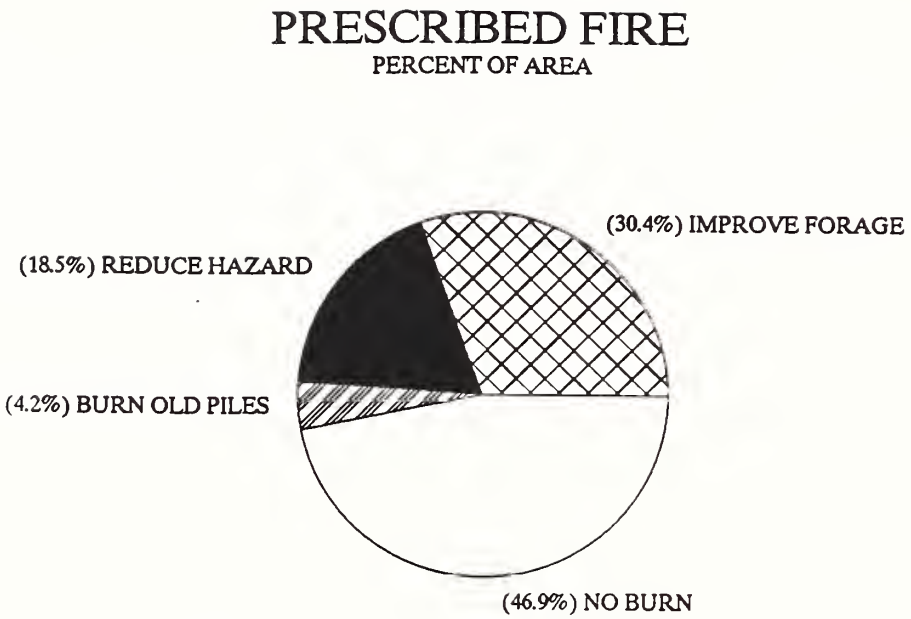



**Figure 6**

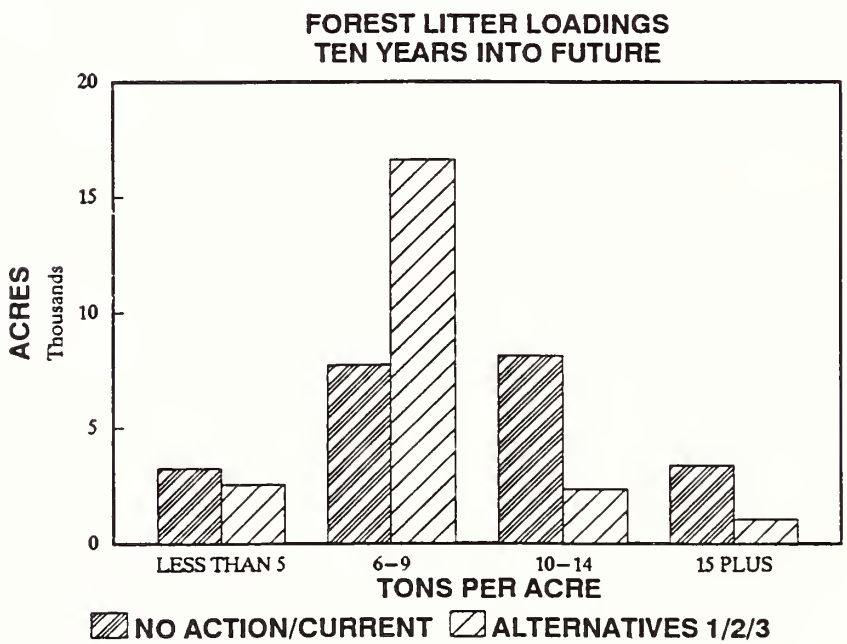
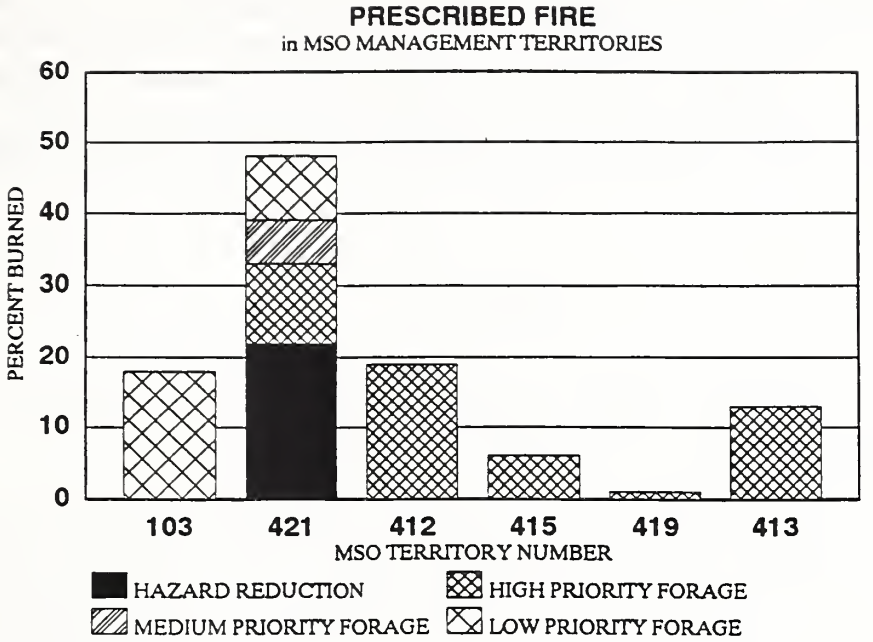


**Figure 7**


PRESCRIBED FIRE
in MSO MANAGEMENT TERRITORIES
PERCENT BURNED
60
50
40
30
20
10
0
103
421
412
415
419
413
MSO TERRITORY NUMBER
HAZARD REDUCTION
HIGH PRIORITY FORAGE
MEDIUM PRIORITY FORAGE
LOW PRIORITY FORAGE

### Conclusions

Nutrient cycling, reduction of wildfire hazard, enhancement of fire dependent species, reduction of dwarf mistletoe, and thinning in seedling thickets are greater for alternatives 1, 2, 3, and 6 than the no action alternatives. Given the burning prescription presented in Chapter 2, and given that the prescription follows recommendations by Harrington and Sackett (1990) which minimize undesirable effects, soil productivity is maintained or enhanced. Key MSO habitat components will also be maintained. Therefore, no significant effects are expected from burning to soils, water quality, and key wildlife species.

### Mitigation

- Burn no more than 25% of a MSO protected activity center in any one year and let the site recover for two more years prior to burning again. In addition, there will be no burning during the breeding season if nests in close proximity are active as determined by monitoring.

- The effects to air quality are mitigated by the following. All prescribed burns are modeled to predict emissions, fuel consumption and smoke dispersion. Air quality predictions are issued daily by the National Weather Service in the form of ventilation data and are included in the daily weather forecasts. These forecasts are used in the daily decision making process to proceed with a burn. Air stagnation and poor dispersion advisories could terminate or curtail burn projects until ventilation improves. Smoke plumes and air quality are monitored during all prescribed burn operations. This can be done using time lapse cameras, lookouts taking pictures, flying the area, or ground personnel. Smoke plume monitoring and weather data forms are completed for each day of burning. Appropriate warning signs are posted when smoke is near or across major roadways.

- Implement Best Management Practices for prescribed fires to insure limited effects to water quality.

## ISSUE #2:
## Lack of Vegetative Seral Stages and Diversity

### SCOPE OF ANALYSIS

Resolution of this issue requires the understanding and analysis of ponderosa pine growth as it relates to vegetative stand structure. Discussions regarding the importance of older seral stages, snags, and unevenage vegetative structure are found in Chapters 3 and 5. The impacts of grazing (Chapters 4 and 5), the lack of fire (Chapter 5), and overstory-understory relationships (Chapter 3) were presented to aid in understanding the effects on the understory, particularly grasses and forbs.

The goshawk guidelines are in effect within goshawk management territories established when goshawk nest/roost areas are detected. Since no goshawks are known to nest/roost within the general vicinity of Pocket/Baker, no goshawk management territories are created and the goshawk guidelines were not implemented. Therefore, discussion to goshawk habitat in the consequences sections is related to landscape level conditions for *future* nest/roost and foraging habitat.

## CONSEQUENCES IN THE PONDEROSA PINE COMMUNITY

### Alternatives 1, 2, 3, 6

**Vegetative Structure in the Overstory**

Figures 8, 9 and 10 compare the resulting vegetative stand structures among the no action and all the action alternatives. There is generally very little difference in vegetative structure after implementation of alternatives and what is projected in 20 years. The most apparent difference (due to the amount of seed cuts in the action alternatives) is the amount in VSS 1/2. There will be higher growth rates in the treated stands (due to the removal of the negative dwarf mistletoe influence), though it is not readily apparent in the 20 year projections. Over a longer period, the difference in growth will become more noticeable.

Existing snags will be retained. Trees 18 inches DBH and over (recruitment snags) will generally be retained unless mistletoe is threatening understory stands of seedlings and saplings. In that case, trees between 18-24 inches DBH will be killed or removed. Based on monitoring on three previous sales (Happy, Hutch-Boondock, and Jacks-Buck), the removal rate is about one 18+ inch DBH tree per 20 acres. Trees 24 inches DBH and over will not be removed, but killed with western pine beetle pheromone baiting. In overstory removal units, most trees over 18 inches DBH are being baited as well with the western pine beetle pheromone. It is estimated that approximately 300 trees between 18-24 inches DBH will be removed. A large proportion of these will be removed in the highway right-of-way for hazard reduction.

While VSS generally describes the average stand condition, it is an indicator of diversity between stands and on landscape levels. Within stand diversity is the level of juxtapositions between groups or clumps. Losses of within stand diversity occur where diversity already exists. If the stand is generally homogeneous, the effects of various prescriptions will maintain or enhance the within stand diversity.

Thinning in the understory (intermediate harvest prescriptions) generally reduces the appearance of an understory by removal of smaller usually codominant or suppressed trees of the same age as the overstory; therefore, there is a reduction of within stand diversity with this prescription.

Unevenage prescriptions generally remove trees of all ages (including old growth trees) and therefore retain the current within stand diversity; however, current stand conditions where unevenage prescriptions are implemented lack the old growth component. Therefore, unevenage prescriptions resemble intermediate harvests and also result in a reduction of within stand diversity.

Removal of the overstory reduces within stand diversity. Seedcuts will also reduce within stand diversity.

Alternatives 4 and 5 result in the greatest amount of within stand diversity, except where timber harvesting and/or burning would have created diversity within even-aged stand conditions. Because of the leave groups within the intermediate prescription of Alternative 6, it represents the greatest within stand diversity of the action alternatives.

**Vegetative Structure in the Understory**

Seral stage and species diversity in the understory is enhanced through implementation of prescribed fire (see discussion above), reduction of overstory canopy, and implementation of a new grazing management scheme.

***Timber Harvesting***

Gambel oak, an important species in Mexican spotted owl habitat, is enhanced through reduction of pines overtopping oaks through timber harvesting and prescribed fire, particularly around the larger oak trees.

Within seedcuts, the amount and diversity of grasses and forbs will be increasing the most due to the low basal area of the timbered overstory. Reduction of canopy in thinnings from below (intermediate, sanitation, and unevenage prescriptions) will result in an increase in grasses and forbs after 6-15 years at a rate that is dependent on the residual basal area, the amount of burning, and the site conditions.

***Livestock Grazing***

Conclusions from monitoring and observations in and adjacent to Pocket/Baker indicate that grasses and forbs will increase in vigor and diversity when the time controlled grazing scheme is implemented (see Chapter 5). Because the grazing scheme is a rest half/graze half concept, there is sufficient flexibility when pastures need to be rested prior to burning. There will be a greater balance between cool and warm season grasses, because there is a reduction in the amount of time an animal continually feeds on the same plant (usually a preferred cool season plant).

With reduced pasture size, livestock will be concentrated in smaller areas which will force the animals to graze plants that would not otherwise be selected. This will lessen the impact on plant species that livestock prefer and improve the long-term growth and health of the remaining less or nonpreferred grasses and forbs.

With the half allotment graze, half allotment rest result, there will be intentional overgrazing from the elk as they follow onto pastures recovering and vacated by the cattle. This overgrazing is defined as an animal regrazing a plant prior to the plant recovering from the first graze. However, because the elk's grazing patterns are manipulated by cattle movement, one half of the allotment will receive substantial rest each year. The net result is that plants gain vigor.

Overgrazing and selective plant species grazing is expected to be greatly reduced, if not eliminated. This will allow for quick plant recovery within the grazed pastures. The increased stock density should allow for increased and more uniform grazing use on the native pine bunchgrass community. The uniform plant use and recovery will benefit Mexican spotted owl prey base species through improved food and cover availability. Regrowth of the grazed pine bunchgrass community will be more palatable to big game species, particularly elk, using the area (Dr. Bill Miller, Elk-Livestock Interactions, 1993 Progress Report). This palatable regrowth is expected to take pressure off historic grazing ungulate concentration areas, thus reducing impacts to MSO foraging areas.

Improved rodent habitat is expected to occur through improved forage and cover conditions. A reduction in habitat competition among rodents is also expected to occur.

Hart and Hart (1993) summarized that the greatest effect from livestock grazing on Southwest rangelands is through the modification of soil hydrologic properties via the trampling of the soil surface and the reduction of vegetative cover. The effects of soil structure degradation by trampling are largely site specific, and are influenced by grazing intensity (Willat and Pullar 1983) soil texture (Van Haveren 1983) and soil water content (Warren and others 1986a, 1986b). Course-textured soils are least susceptible to bulk density increase from trampling. Wet soils are more susceptible than dry soils (Warren 1986a). Based on monitoring conditions in the Red Hill study and other adjacent lands, and based on the textures of existing soils and season of graze, compaction from livestock is not occurring in the Pocket/Baker area except for some localized compaction around stock tanks and in holding pens.

Reduction of vegetative cover in riparian areas (and total degradation in many cases) has been a well documented effect of livestock grazing in the Southwest (Harker and others 1993, Wuerthner 1993). However, within the Pocket/Baker area only Horsetank Wash has streamside riparian habitat. There is no livestock grazing occurring in the riparian areas of Horsetank Wash. And while damage has occurred at Garden Springs, the primary cause is attributed to recreationists.

## Alternatives 4, 5

### Vegetative Structure in the Overstory

The dominant VSS classes in the pine type will continue to be young and middle-aged. The sites with A canopies (47% of Pocket/Baker) will continue to grow at high rates (lower rates on poorer sites) toward denser canopy conditions and larger diameters. Figures 8, 9, and 10 indicate the vegetative structure currently, after implementation of alternatives, and 20 years in the future. Twenty years growth will add a significant amount to the VSS 4 and 5 structure.

Those stands with moderate and high infections will continue to grow at reduced rates (estimated at 50-75%) of the uninfected stand rate. Over the long term, trees with mistletoe infection will take longer to reach large tree status, diameters large enough for snag recruitment. Existing snags will continue to be created at a slow rate partially through mortality from dwarf mistletoe.

### Vegetative Structure in the Understory

In the short term, the continuance of the current grazing scheme under Alternative 4 until 1996 will maintain the current grass and forb diversity and vigor. Then, as livestock are no longer grazed, plant diversity and vigor should increase, particularly with any broadcast burning (if proposed through other project proposals) .

Alternative 5 simply continues the current levels of diversity and plant vigor because the current management scheme continues. Because the existing pastures are very large, there is very little control over livestock use. Both overgrazing and under-utilization will continue. The result of both over- and under-utilization is a reduction in the amount of organic material which results in the decline of soil productivity. The percentage of cool season grasses will increase as a result of the selective grazing by cattle, and the length of time cattle are in a particular pasture.

Without the replacement of gates with cattle guards, livestock will continue to venture onto State Highways 87 and 260 when pastures are occupied and gates are left open, being hazards to motorists.

## CONSEQUENCES IN GENERAL WILDLIFE HABITAT

### All Alternatives

### Timber Harvesting

Figures 8, 9 , and 10 indicate the specific effects on the vegetative stand structures. There will be a slight increase in VSS4 habitat, but the overall amount of moderately dense ("B") canopy will be somewhat reduced. The snag resource will not be impacted by any of the action alternatives since none will be cut. Wildlife cover requirements are above the minimal standards (30% in the Forest Plan) for all alternatives ranging from 38-41%. Covered wildlife corridor sites in the Pocket 10K are not affected by proposed harvesting. Covered wildlife corridors in the Baker 10K sites are reduced by 5% from approximately 48% to 43% in alternatives 1, 2, 3, and 6.

The amount of Abert squirrel habitat for nesting and escape cover is reduced from 33% of the total 20K pine type to at most 28% (Alternative 2). Twenty year projections show all alternatives to be between 62-66%.

Harvest treatments are not proposed for any of the blocks of developing or existing old growth. Known and potential turkey roosts are not being proposed for cutting.

Proposed harvest treatments are not expected to impact existing water resources.

The net effect to the general wildlife habitat is a slight decrease in VSS3 habitat and an increase in VSS4 habitat which is preferred by a greater number of species (see Chapter 5). The overall canopy density will be slightly reduced for 5-10 years reducing the amount this habitat in the short term. The displacement of species is expected to be minimal and not significant.

### Livestock Grazing

The range management proposal (which is common to all action alternatives) is not expected to present an affect to the following indicator species, their habitat, or other habitat components evaluated in this document: red squirrels, Abert squirrels, old-growth structural features, snags, cover (provided by trees), turkey roost (structural feature), and overall VSS. Livestock grazing affects big game (deer, elk, and turkey) in diverse ways.

Grazing may affect turkey nesting habitat through the reduction of herbaceous vegetation used by turkey as screening cover around the nest site. However, due to the time at which livestock would be turned out (July) on the allotment, the effects would most likely be to those areas that hens with poults would occupy following nesting (brood areas). Concentrated livestock grazing has the potential of significantly reducing the effectiveness of an area as brooding habitat through the loss of cover and forage.

A summary of research in the Southwest by Nowakowski and others (1982) concluded that deer and cattle do not compete under proper stocking, but may compete in the following situations: 1) on overgrazed range, 2) in early spring when grasses are used more by deer than in other seasons, and 3) where cattle heavily utilize browse in overgrazed winter range. No competition is expected by the proposed range proposal because the range is not generally in an overgrazed condition, cattle are not on the range in early spring, and there is no winter range in the Pocket/Baker area.

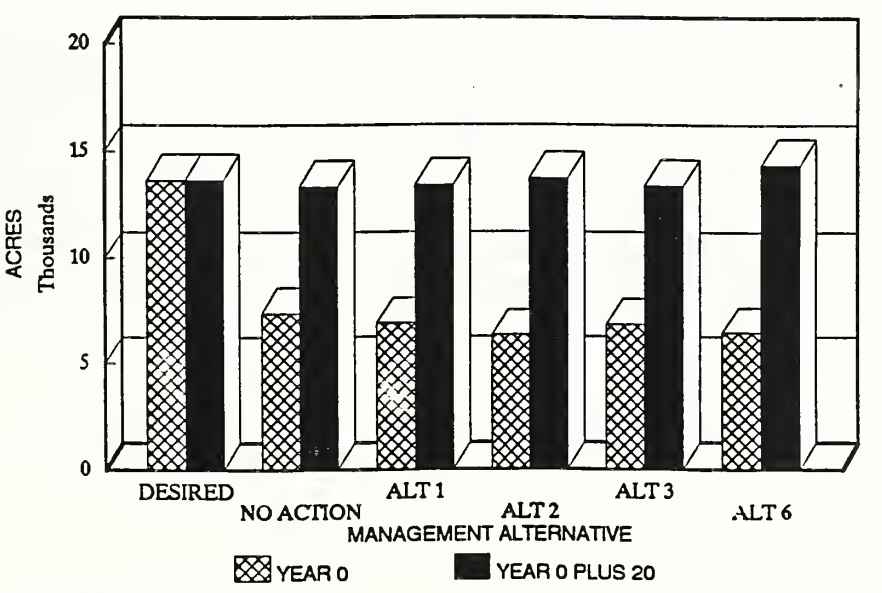
The rapid increase in the elk population in Units 5A and 6A (the Arizona Game & Fish Dept. hunt units within which the Calf Pen and Baker Lake Allotments lie) is an indication of the effects of cattle on elk. The increase in the elk population has occurred under the current system of livestock management. Although maintenance of the current elk population (or any further increase) may not be desirable from a vegetative standpoint, the proposed livestock management system is not expected to alter the trend in use of the 20K by elk. In fact, the proposed system may actually improve conditions for elk. Improved conditions are likely to occur from reduced competition (for forage and space) in that half of the proposed newly created allotment would be rested (from livestock use) for an entire growing season. For the half of the allotment that would be grazed, cattle would be confined to smaller pastures for shorter periods of time. This in affect is expected to force the use and breakdown on those plants which would not ordinarily be used by either cattle or elk. Therefore, affects of continued selective grazing are reduced, and a more palatable regrowth of plants is available for use by elk, as well as other wildlife species.

## CONSEQUENCES IN GOSHAWK HABITAT

Potentially suitable nesting stands are reduced from suitable to unsuitable depending upon the following: harvest prescription, amount of mistletoe present, condition and harvest prescription of surrounding stands, and the amount of topography present. For the analysis of foraging stands, a "good" rating is given to stands which have a "B" canopy, or better, in VSS 3 or above (the 643 acres of 5A has also been included as "good"). Stands lose their "good" rating when they will be reduced to an "A" canopy.

None of the alternatives (including No Action) currently meet the desired condition for moderately dense to dense canopy in VSS 4. However, in the long term (within 20 years), nearly all alternatives meet the level of VSS 4+ habitat recommended by the Goshawk Scientific Committee (see Figure 11). For all the action alternatives, over the long term (>50 years), there will still be an overall reduction in potential nesting habitat as VSS and canopy density decreases in stands which have moderate to high mistletoe infection and are not thinned during this entry. As a result, the amount of potential nesting habitat will also decrease.

**Figure 11**
**VSS4B+ Goshawk Habitat**




Includes 4B/C, 5B/C, 6B/C

**All Alternatives**

**Timber Harvesting**

The following table indicates the amount of potential nesting/roosting and foraging habitat that is being altered by implementation of each of the alternatives.

Table 16:
Changes in Goshawk Habitat After Implementation of Alternatives *

| ALTERNATIVE | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| % Potential Nest/Roost Habitat | -7 | -9 | -2 | 0 | 0 | -5 |
| | | | | | | |
| %Foraging Habitat (Current) | -9 | -18 | -7 | 0 | 0 | -18 |
| %Foraging Habitat (20 Years) | +42 | +41 | +44 | +42 | +41 | +41 |

* based on 4, 005 acres of current potential nest/roost acres; and 12, 519 acres of current good foraging habitat.

Overall prey species abundance and diversity is not expected to change much with these thinnings. In stands which are reduced to an "A" canopy, closed forest dwelling species (Abert squirrel, woodpeckers) would decline or become absent while open forest dwellers (mantled ground squirrel, cottontails, mourning dove, some chipmunks) would increase in numbers. While an open forest is less likely to be used by a goshawk, there would be trees remaining which could be used for hunting perches. In the long-term, there would still be a decline in prey diversity and abundance in stands which are highly infected with mistletoe and are reduced to a more open grassland condition. However, with the thinning prescriptions, the level of mistletoe infection would be decreased, resulting in a reduced spread of infection. There would also be a greater mosaic of forested stands, than in the "No Action" alternatives, providing for a greater abundance and diversity of prey species.

For alternatives 4 and 5, in the short term, the amount and quality of goshawk foraging habitat will remain the same, though levels are below desired conditions. In 30-60 years, the trend will be a decrease in the overall canopy density as mistletoe infected trees start to die. As a result, the amount of foraging goshawk habitat will also decrease. Prey species abundance and diversity will not change in the short term. In the long term there will be a shift in the proportion of prey specie types. Species which rely on closed canopy forest conditions, like the Abert squirrel, will start to decline as trees start to deteriorate from mistletoe. Other species that prefer a more open forest (golden mantled ground squirrel, cottontail) will likely increase.

**Livestock Grazing**

Overstory structural components (tree size class, canopy closure, and seral stages) provide nest sites and perches for hunting and feeding. These structural components, particularly conifer trees, are generally not impacted by livestock grazing.

A certain portion of the goshawk prey species' habitat is either directly or indirectly affected through the reduction of understory vegetation and livestock hoof action. Direct effects are the temporary elimination of food (foliage and seeds) and shelter for prey species. Mammals and birds which spend a lot of time on the ground could be heavily impacted. Indirect effects are the temporary elimination of food and/or shelter for the invertebrates which are a part of the diets of the goshawk prey species. Birds, mammals, and reptiles may be indirectly impacted. Some prey species may benefit from grazing due to the regrowth of succulent vegetation. Water development has probably changed the density and distribution of some prey species.

There is some uncertainty as to how the effects on prey habitat translate to prey species availability for the goshawk. Changes in prey numbers could result in slight shifts in the various prey frequency in the goshawk diet. For example, a reduction in grass height may expose turkey poults, a known prey item, to increased aerial predation by goshawks and other raptors. Goshawks may also shift foraging patterns within their home range. Goshawks, like many predators, switch to alternative prey as particular species become more available, leading to both seasonal and annual changes in diet (Opdam 1975 and Opdam and others 1977 in Petty 1989). Changes in prey availability can be caused by a variety of factors including grazing, wildfire, prescribed burning, logging, agriculture, pesticides/herbicides, and weather.

Management recommendations regarding livestock grazing and goshawks in General Technical Report RM-217 are: "Wildlife and livestock utilization on grasses and forbs should average 20% by weight and not exceed 40% in any area, and shrub utilization should average 40% by weight and not exceed 60% in any area." . The 20% to 40% utilization guideline is stated to be applicable to continuous season-long or yearlong grazing; and that, this use level does not reflect the capabilities of certain plants and grazing systems (Elson 1993). The "40% by weight" utilization guide for shrubs infers use of 40% of the total weight of the shrub which would result in a severely hedged shrub plant, and eventual loss of the shrub (Elson 1993).

Elson and others (1993) argue "there is no direct research which relates ungulate use levels of vegetation and goshawk prey base." The Arizona Game & Fish Department (1993) states "the Department has been unable to find any scientific literature which indicates that an average utilization of 20% on grasses and forbs advocated in the MRNG [Management Recommendations for the Northern Goshawk in the Southwestern United States] will significantly benefit any of the goshawk prey species identified."

Small mammal populations were found to be regulated by the abundance of large downed woody material, and not herbage production (Goodwin and Hungerford 1979 in Arizona Game & Fish Department 1993). The understory vegetation provides forage and cover for goshawk prey species, and for the invertebrates (ants, beetles, caterpillars, spiders, etc.) on which the prey species also use as a food source.

Since goshawk foraging habitat is dependent more on large downed woody material than forage utilization, the net effect of livestock grazing on goshawk habitat is insignificant.

## CONSEQUENCES IN MEXICAN SPOTTED OWL HABITAT

### All Alternatives

### Timber Harvesting

Under all action alternatives, there are no harvest treatment in MSO "protected activity centers" (PAC's), mixed-conifer sites, steep slopes, reserved lands, VSS 5 and 6 sized classed trees, riparian areas, or sites meeting nesting/roosting threshold conditions (all except under Alternative 3). Therefore, the proposed harvest treatments occur in the ponderosa pine/Gambel oak "restricted area", and the ponderosa pine vegetation type of the "other forest and woodland type area". Table 17 summarizes the amount of acres of harvest within each of the habitat types described in the Recovery Plan. The following acronyms are used to describe the levels of MSO habitat:

**PP:** ponderosa pine.

**P/O:** ponderosa pine/Gambel oak.

**POTH:** ponderosa pine/Gambel oak vegetation type which currently meets MSO target threshold conditions for nesting/roosting.

**POPT:** ponderosa pine/Gambel oak vegetation type which has the potential of developing into MSO target threshold conditions for nesting/roosting.

**PONP:** ponderosa pine/Gambel oak vegetation type which does not have the potential of ever meeting the MSO target threshold conditions for nesting/roosting.

Under Alternative 3, current threshold habitat is reduced by 116 acres. Alternative 3 was initially created when the Draft Recovery Plan was issued. Changes in the definition of threshold habitat resulted in 116 acres of treatment being classified as current threshold habitat. These treatments would be expected to reduce existing threshold conditions below the targeted minimums. These POTH sites are deferred from treatment under Alternatives 1, 2, and 6. However, over the long term, this deferral from treating the moderate (Site 687/8) and high (Site 687/17) mistletoe infections of the two sites may impact the effectiveness of retaining nesting/roosting qualities.

Under all action alternatives, harvest treatments are not proposed for any of the mixed-conifer sites. Therefore, the existing and potential threshold conditions are expected to persist in these sites.

Table 17:
Comparison of Harvest Treatments by MSO Recovery Plan Habitat Forest Types.

| | Recovery Plan Habitat Management Forest Types | | | | |
|---|---|---|---|---|---|
| | PP | POPT | PONP | POTH | TOTALS |
| **Alternative 1:** | | | | | |
| Pocket | 708 | 548 | 856 | 0 | 2112 |
| Baker | 1168 | 2317 | 0 | 0 | 3485 |
| 20K | 1876 | 2865 | 856 | 0 | 5597 |
| % of 20K P/O[1] | | 26% | 8% | | 34% |
| % of 20K POPT[2] | | 36% | | | |
| **Alternative 2:** | | | | | |
| Pocket | 762 | 830 | 1274 | 0 | 2866 |
| Baker | 1278 | 2587 | 0 | 0 | 3865 |
| 20K | 2040 | 3417 | 1274 | 0 | 6731 |
| % of 20K P/O | | 31% | 12% | | 43% |
| % of 20K POPT | | 43% | | | |
| **Alternative 3:** | | | | | |
| Pocket | 176 | 143 | 84 | 0 | 403 |
| Baker | 704 | 2876 | 0 | 116 | 3696 |
| 20K | 880 | 3019 | 84 | 116 | 4099 |
| % of 20K P/O | | 28% | <1% | | 29% |
| % of 20K POPT | | 38% | | | |
| **Alternative 6:** | | | | | |
| Pocket | 83 | 745 | 1062 | 0 | 1890 |
| Baker | 875 | 2265 | 0 | 0 | 3140 |
| 20K | 958 | 3010 | 1062 | 0 | 5030 |
| % of 20K P/O | | 28% | 10% | | 39% |
| % of 20K POPT | | 38% | | | |

1: percent of the total site acres (10,826) listed as pine/oak vegetation type in the 20K.

2: percent of the total pine/oak vegetation type which has the potential of meeting MSO threshold nesting/roosting habitat (7900 acres).

Since the current threshold habitat does not exist within the minimum 10% of the pine-oak area, sufficient sites must be selected that represent the habitat whose conditions most closely approaches threshold conditions. The total pool of those sites have been identified (164). Table 18 lists by groups the proposed harvest acres in the "next best" pine-oak potential threshold habitat. The difference between groups was based on site potential, and a subjective opinion regarding the value of each of the components of nest/roost habitat, slope conditions, and the hierarchy in relation to one another. This grouping is not defined in the Recovery Plan, and is a subjective attempt to find the best of the best. In reality, there may be little if any difference in the potential between groups 1-3. However, groups 4, 5, and 6 were subjectively determined to have lesser desirable conditions than groups 1-3 (164). Groups 1-3 represents the "best of the best" .

Table 18. Proposed Harvest Treatments in the Best POPT Habitat

| Groups | Site Acres Meeting "Best" Conditions | Alternatives (Proposed Harvest Treatment Acres) | | | |
|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **6** |
| 1 | 359 | 21 | 21 | 21 | 21 |
| 2 | 290 | 0 | 0 | 0 | 0 |
| 3 | 146 | 96 | 96 | 96 | 96 |
| 4 | 83 | 54 | 54 | 54 | 0 |
| 5 | 912 | 436 | 464 | 399 | 395 |
| 6 | 208 | 77 | 147 | 0 | 116 |
| TOTALS | 1998 | 684 | 782 | 570 | 628 |

Although the proposed intermediate harvest treatments are expected to lessen threshold conditions on 117 acres of the three highest groups of sites, 678 acres of the "best" potential threshold sites would remain. This equates to 8 acres less than the minimum amount of acres needed to meet the Recovery Plan guideline. From the remaining pool of untreated acres in Groups 4 and 5, more than enough acreage is available to exceed the minimum guideline.

**Livestock Grazing**

Effects of grazing on the Mexican spotted owl (MSO) have not yet been substantiated with research studies. However, research has identified specific habitat requirements for the prey species taken by MSO's. Research also has been done on the effects grazing activities have on MSO prey species densities and diversity. Based on prey species research, and the know effects grazing imposes on soil and vegetation suggests that grazing influences MSO prey availability and habitat conditions (USDI 1995).

Studies cited in the Mexican Spotted Owl Recovery Plan indicate grazing has little effect on deer mice (Reynolds 1980 in USDI 1995), but significantly decreases vole populations, due to loss of cover in mesic habitats (Grant and others 1982 in USDI 1995).

The presence of ungulates and their grazing are not expected to alter the structural habitat features (rock outcropping, down logs) needed by the woodrat for nesting and escape cover. Oak and locust occurs in varying patch sizes and diameter classes throughout the 20K. Browsing on the shrub form of these two species appears to be insignificant; and therefore, providing an added habitat component for the woodrat and the brush mouse. Meadow habitat and forest edges are very limited; and therefore, the expected limited presence of the pocket gopher and the long-tailed vole. The limited amount of meadow habitat in the 20K, and attractiveness of these areas to grazing ungulates, is likely to produce an adverse impact to these two species.

Change from the current large pastured, long duration livestock grazing regime to the proposed smaller pastured, short duration (time controlled) grazing has it's tradeoffs. Under Alternatives 1, 2, 3, 6 , the short duration grazing would employ a larger number of livestock, in smaller pastures, for a shorter period to achieve improved use of the available forage. Livestock would be forced to use bunchgrasses not normally taken under the large pasture, long duration graze period. Therefore, the bunchgrasses would be expected to experience improved vigor through the reduction of accumulated, rank foliage. The short duration graze would result in higher use levels than are prescribed by the Region 3 - Range Analysis Handbook. However, the short duration graze would mean that livestock occupy an area for a significantly shorter period of time, allowing regrowth on grazed plants. This in effect reduces overgrazing, by livestock, on selected plants, and would provide increased rest for plants between livestock use periods.

Overgrazing and selective plant species grazing is expected to be greatly reduced, if not eliminated under the proposed method of livestock management. This will allow for relatively quick plant recovery within the grazed pastures. The increased stock density should allow for increased and more uniform grazing use on the native pine bunchgrass community. The uniform plant use and recovery will benefit MSO prey base species through improved food and cover availability. Regrowth of the grazed pine bunchgrass community will be more palatable to big game species, particularly elk, using the area (Dr. Bill Miller, Elk-Livestock Interactions, 1993 Progress Report). This palatable regrowth is expected to take pressure off historic grazing ungulate concentration areas, thus reducing impacts to MSO foraging areas.

## COMPARISON, CONCLUSIONS, AND MITIGATION (Issue #2)

### Comparison of Alternatives

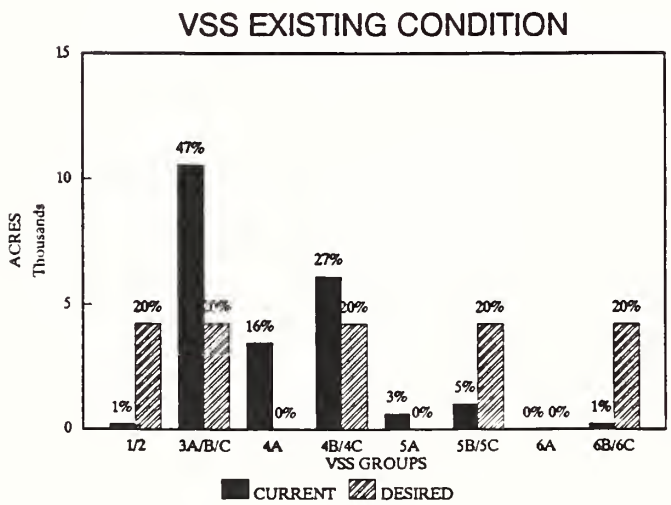
The following lists the units of measure that were selected to measure attainment of project objectives and resolution of issue #2.

a. The vegetative structure stage amount current and future.
**Measure:** Acres of VSS (Figures 8, 9, 10).

b. Understory vegetative cover.
**Measure:** Narrative on grazing and burning changes and the resultant understory response (see above and discussion for Issue #1).

c. Within stand diversity.
**Measure:** Narrative on resulting stand conditions after each alternative (see above).

**Figure 8**
**VSS Structures Current and In 20 Years**



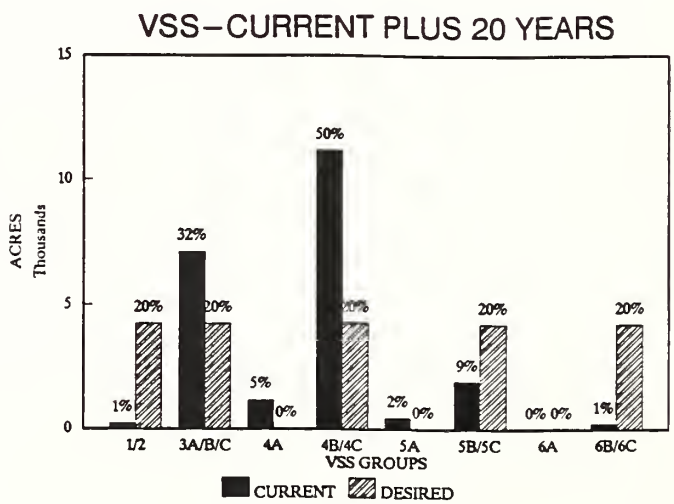



**Figure 9**
**VSS After Implementation of Alternatives**

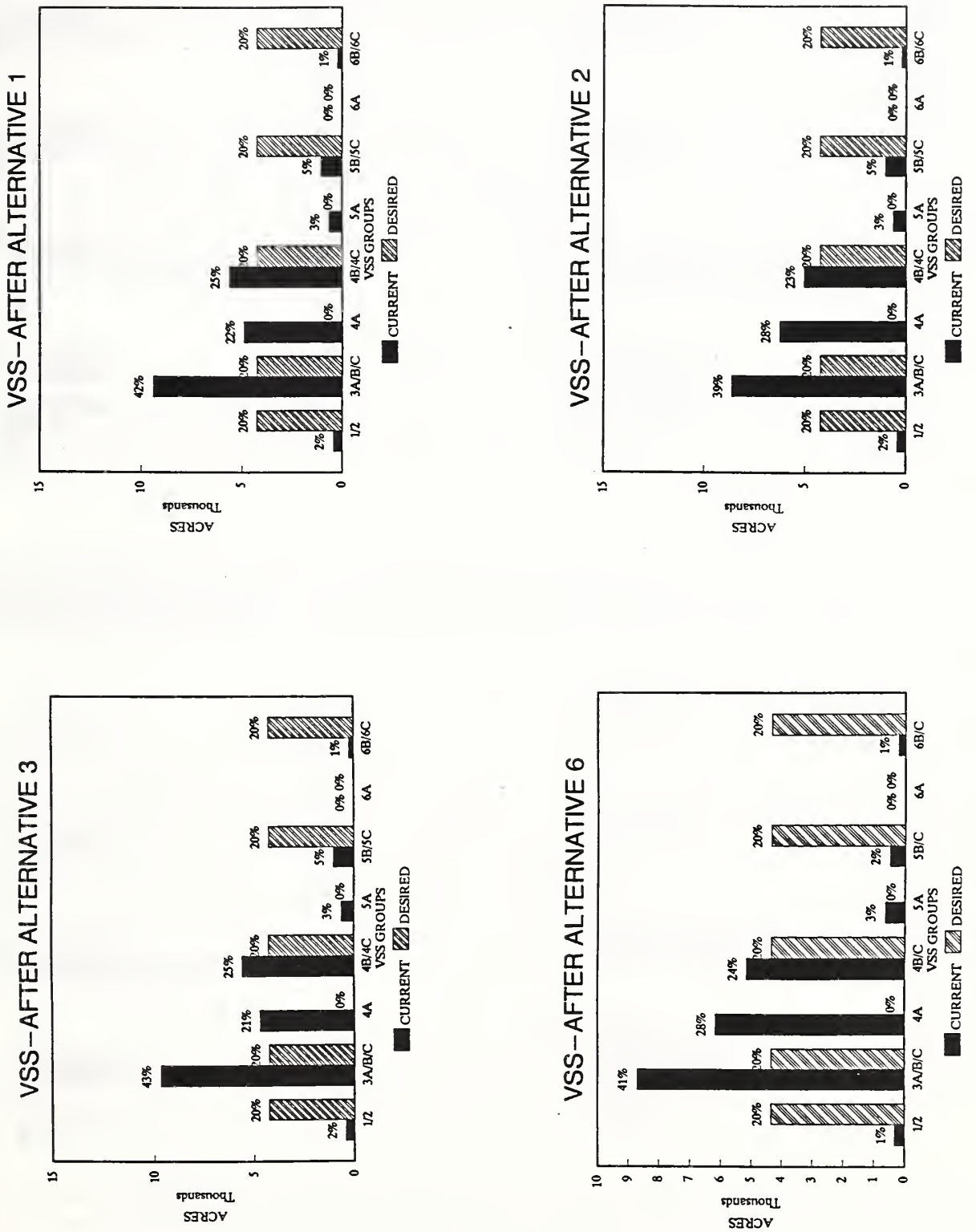
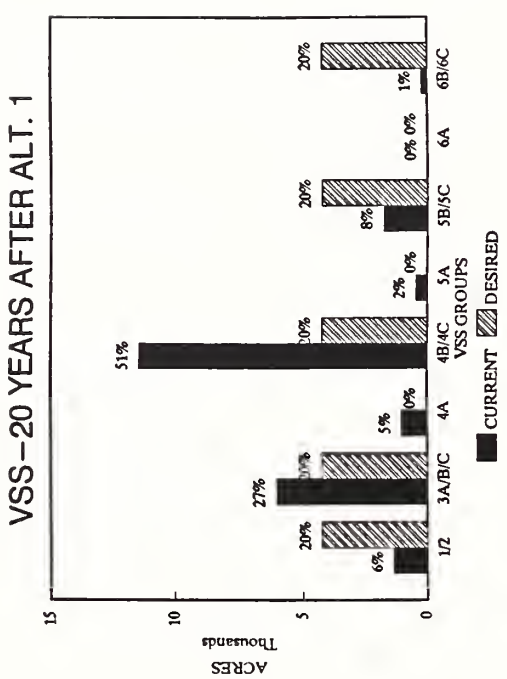
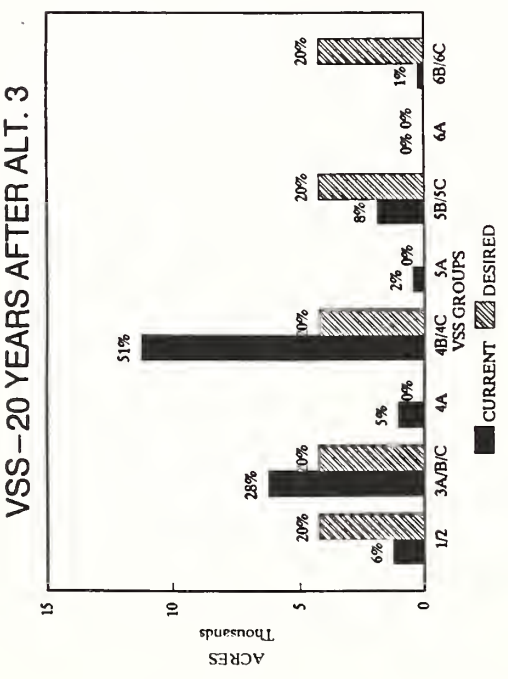
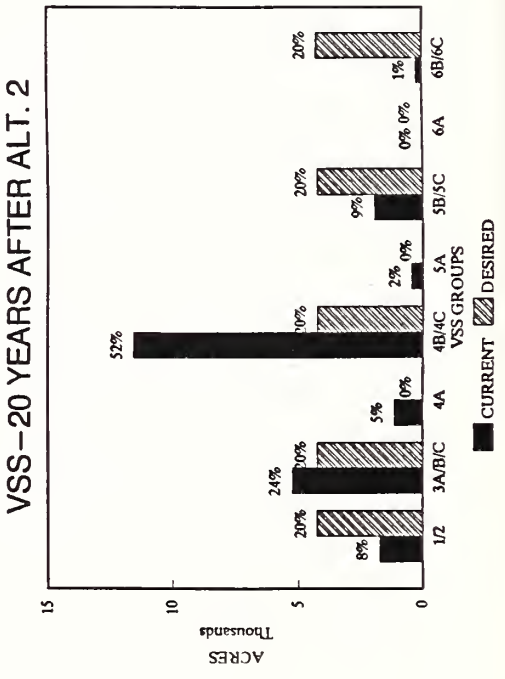
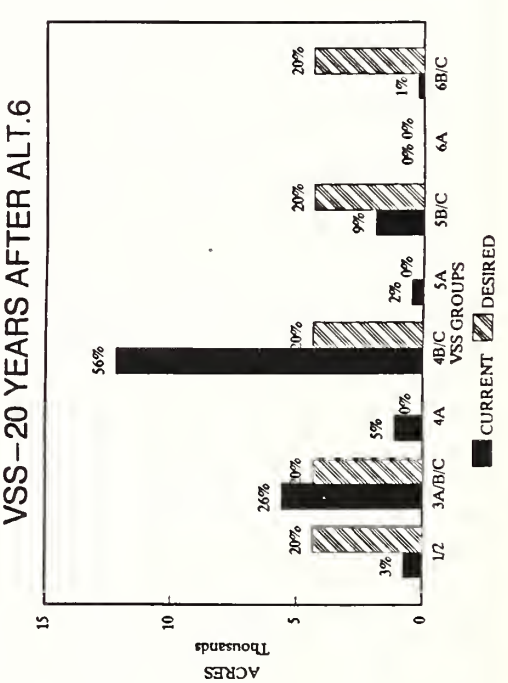


**Figure 10**
**VSS Projected 20 Years Into the Future**



### Conclusions

Alternatives 1, 2, 3, and 6 (by virtue of timber harvest) alter the proportion of acres within VSS 3 and VSS 4. Otherwise, there is no difference between all alternatives regarding vegetative stand structure. However, in 20 years, the action alternatives have a greater proportion of VSS 4 than alternatives 4 and 5 (no action alternatives). Within stand diversity among the action alternatives is greatest in Alternative 6.

All alternatives, except 3, meet the guidelines of the MSO Recovery Plan. Alternative 3 reduces existing pine-oak nesting/roosting habitat by 116 acres. There is a reduction of potential nesting/roosting and foraging habitat for the northern goshawk immediately after implementation of Alternatives 1, 2, 3, and 6, but there is virtually no difference in habitat conditions in 20 years between all the alternatives. Due to mobility of goshawks and the lack of occupied goshawk habitat, there is little if any affect to goshawks (165).

### Mitigation

- Known turkey roost sites have been posted with numbered wildlife tree signs. Should nesting turkeys be found, logging activities will be deferred within 1/4 mile of the nest from April 15 through June 30.

## ISSUE #3:
## Developing and Sustaining Old Growth Tree Structure

### SCOPE OF ANALYSIS

Resolution of an important part of this issue requires analysis of the canopy characteristics existing currently and in the future, as they relate to the ability to maintain or grow into old growth structure, particularly considering the effects of dwarf mistletoe (see Chapter 6). The sustainability of current existing old growth structure and dense conditions and the creation of future old growth structure and dense conditions are determined by the current level of dwarf mistletoe and the stand characteristics. Treatments to retard the growth-slowing effects of dwarf mistletoe are more harsh the greater the infection level. Where habitat conditions are currently limited like old growth and dense canopy stands, opportunities to reduce the effects of dwarf mistletoe will likely be limited without affecting those current stand characteristics.

The long-term effects of mistletoe on ponderosa pine canopy closures are difficult to predict. An analysis of long-term effects has been done, but the numbers generated should be taken as trends and not absolutes. Therefore, projections of "x" acres doing this or that is merely an estimate, a reflection of one trend compared to another.

The effects analysis in this section will be limited directly to mistletoe and vegetative stand structures for dense canopies and old growth. These vegetative structures are particularly important for the recovery of the Mexican spotted owl. These structures are equally preferred by a majority of the Coconino wildlife species.

## CONSEQUENCES ON THE PONDEROSA PINE VEGETATIVE STRUCTURE

### Alternatives 1, 2, 3, 6

Alternatives 1, 2, 3 and 6 treat 1760, 2894, 2056 and 1473 acres, respectively, of moderate and high level dwarf mistletoe (see Figure 12). At this rate of treatment per decade, the current moderate and high DM sites could be treated in 6-7 decades. This means, at worst, that in the long term, approximately 9000 acres (39% of the Pocket/Baker analysis area) of the landscape will be in the seedling and sapling stage. Over the long term, if this treatment trend continues, there will be some displacement of wildlife species dependent on older seral stages. Species depending on younger seral stages will benefit, however. In 20 years, however, there is very little difference among the three alternatives in the amount of vegetative stand structures (see Figures 8, 9, 10).

In the low and moderate infection level sites, the stand structure will tend toward a higher VSS group in thins from below and sanitation prescriptions due to the removal of mostly smaller infected and overstocked trees. Increased growth occurs more from stocking control, then from the treatment of the mistletoe.

As indicated by Hawksworth (1978) and Knutson and Tinnin (1980) a significant amount of mistletoe will occur 5 years after the original treatment due to latent infection. As a result current proposed thins from below and sanitation units will likely have a level of mistletoe higher in five years than immediately after the proposed harvest. Depending on resource objectives, there may need to be additional treatments within 10 years.

Seed cuts of high infection level sites will provide for a relatively clean seedling/sapling stage when the stand becomes established (anywhere from 1-30 years). When regeneration becomes established, infected overstory trees will be removed, or killed (for the retention of snags). Trees will be killed using western pine beetle pheromone. Additional treatments will be required in adjacent stands to remove DM infection sources when regeneration becomes established. Regenerated stands (seed cuts) and stands where infected overstory has been removed (overstory removal) will grow at good rates and provide future options for initiating treatments that lead to multi-layered vegetative structure.

The vegetative structure continues to be predominantly even-aged, especially where seed cuts are prescribed to regenerate the stand. However, options for creating multi-layer vegetation structure in future actions are much greater for those stands where mistletoe is at the low infection level. The resulting prescriptions will leave approximately 50% of the Pocket/Baker area for all alternatives at a low infection level (see Figure 13).

The untreated sites of low infection level will continue on a pace to reach moderate infection levels; the remaining untreated moderate infection level sites will continue on a pace to reach high infection levels; and the remaining untreated high infection level sites will continue to increase in DM intensity, with increasing mortality (mostly within smaller trees), and eventual canopy density decline.

### Alternatives 4, 5

The current levels of dwarf mistletoe remain unchanged. DM increases. In the short term there is a reduction of growth in ponderosa pine depending on current tree infection level. The growth loss occurs at the tree level, rather than the stand level, with DM ratings of 6 losing 1/2 the normal tree growth. However, stands will continue to increase in overall growth. The mortality will generally occur in small diameter trees with infection ratings of 5 or 6. Long term impacts are difficult to assess due to the numerous unknown variables, but infestation untreated will increase in intensity. Figure 14 is presented to help visualize the acres of dwarf mistletoe infestation that will increase in intensity over the years when left untreated.

## CONSEQUENCES IN DENSE CANOPY HABITAT

### Alternatives 1, 2, 3, 6

In the long term within thins from below and sanitation sites, there will be a higher growth rate due to the low levels of DM, and stocking reduction. This includes a higher canopy closure density for a longer time providing higher quality foraging and nesting/roosting habitat for dense canopy dwelling species (see figures 15 and 16).

### Alternatives 4, 5

The net effect of not treating any of the moderate and high level infection sites is increasing spread and intensity on the infected acres. Figure 17 indicates the current levels of dwarf mistletoe by canopy closure class. This figure may be helpful in realizing the amount of future infestation in the various canopy classes. Figure 18 displays similar information for the various MSO habitats. The long term net effect of not treating any of the 20,753 acres of low, moderate, or high infection sites is a reduction in the amount of time the vegetative structure will maintain current and future, dense canopy conditions.

In the long term, the area will continue to move towards the time at which C canopies will begin to decline in 30-60 years.

## CONSEQUENCES TO OLD GROWTH

### All Alternatives

Current old-growth stands are not entered and therefore will continue to function as old growth even though mistletoe infections will increase. Impacts to existing old growth are difficult to predict. Depending on competition from younger trees, site conditions, and age of old growth, there will be a range of time frames that the old growth conditions will persist.

## COMPARISON, CONCLUSIONS, AND MITIGATION (Issue #3)

### Comparison of Alternatives

The following lists the units of measure that were selected to measure attainment of project objectives and resolution of issue #3.

a. Amount of each dwarf mistletoe category treated.
**Measure:** Percent treated (Figure 12).

b. Amount of low infection level current and future.
**Measure:** Acres of low infection level (Figure 13).

c. Canopy closure current and future.
**Measure:** Acres of each canopy class (Figures 15 and 16).

d. Amount of DM affecting future levels of vegetative stand structures.
**Measure:** Current acres of DM by VSS (Figure 14).

e. Amount of DM affecting future levels of canopy closure.
**Measure:** Current acres of DM by canopy closure (Figure 17).

f. Amount of DM affecting future levels of MSO habitats.
**Measure:** Current acres of DM by MSO habitat types (Figure 18).

**Figure 12**

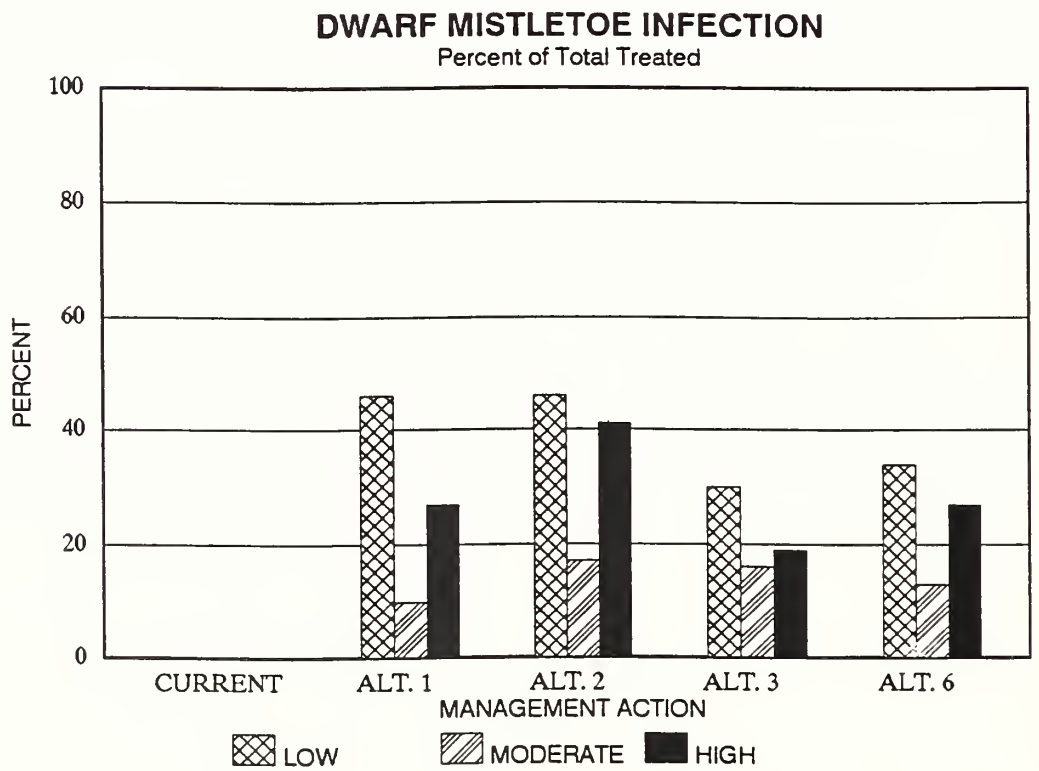


**Figure 13**

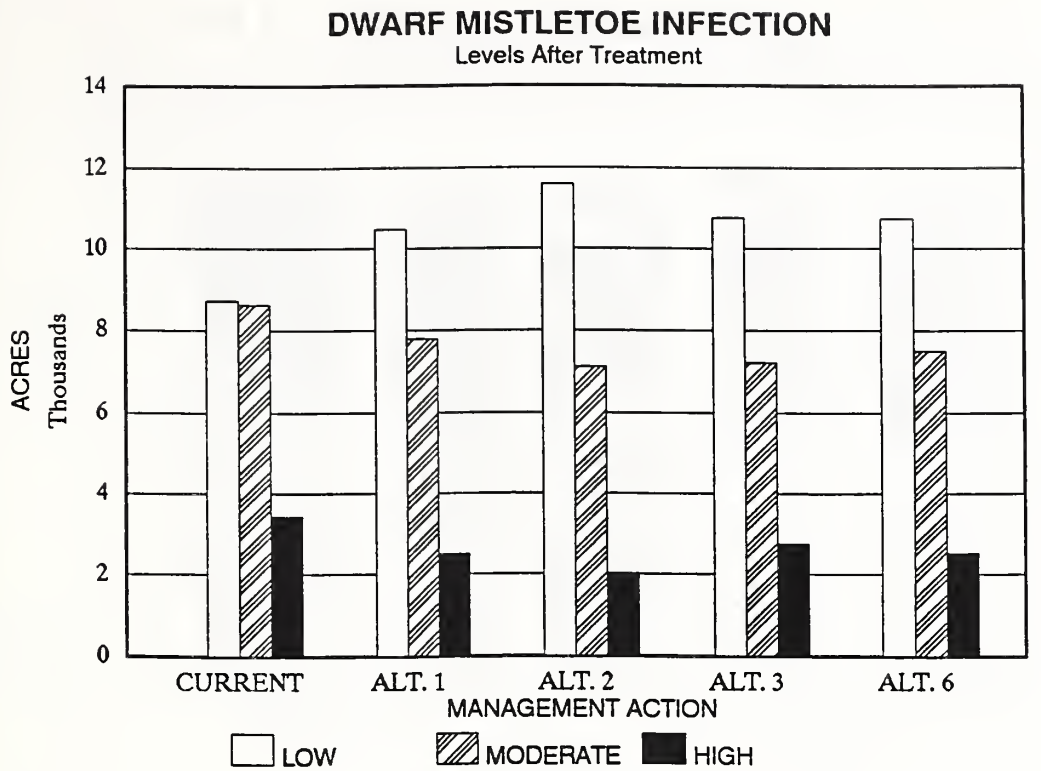
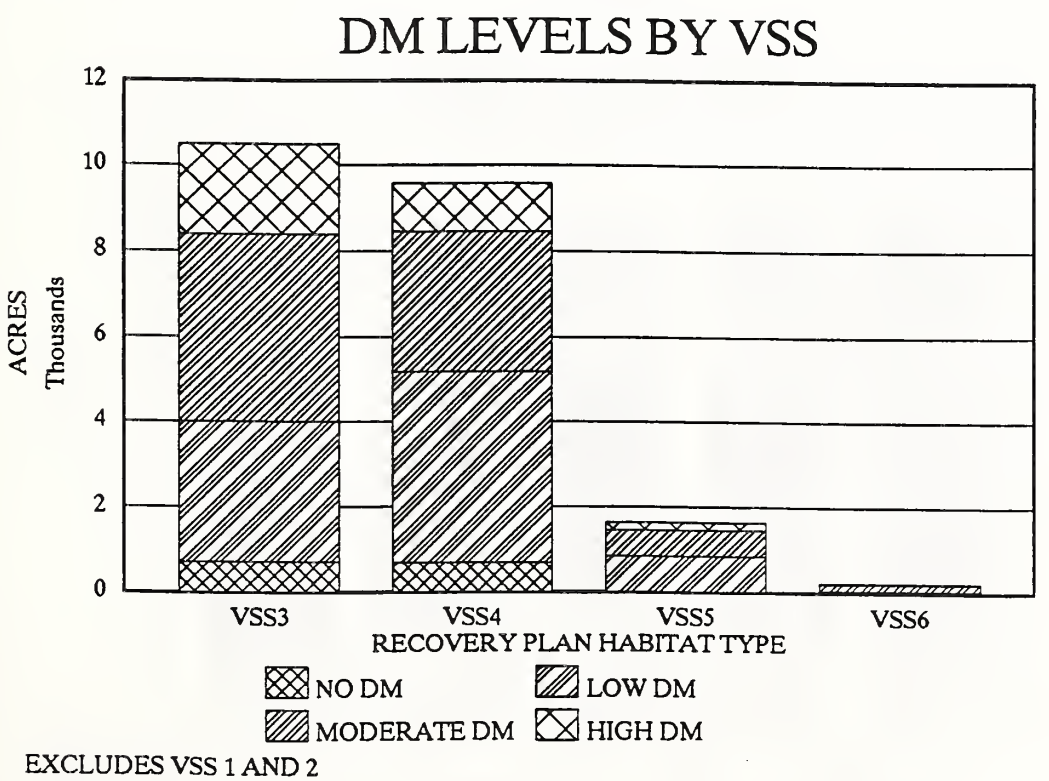



**Figure 14**




EXCLUDES VSS 1 AND 2

**Figure 15**

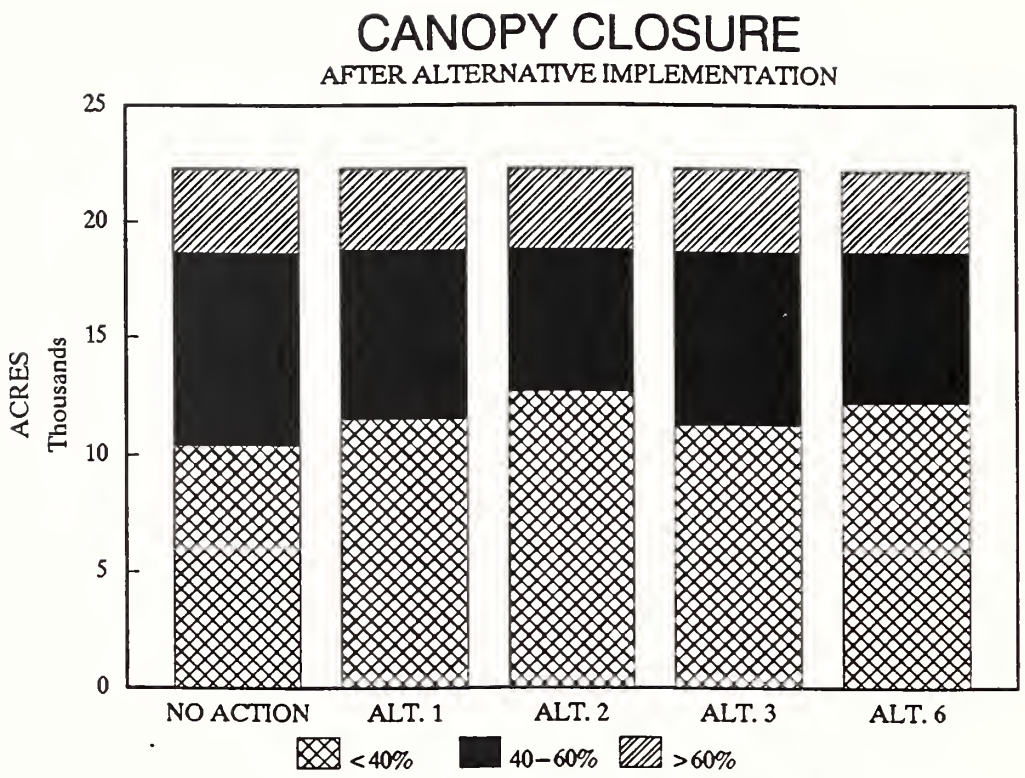



**Figure 16**

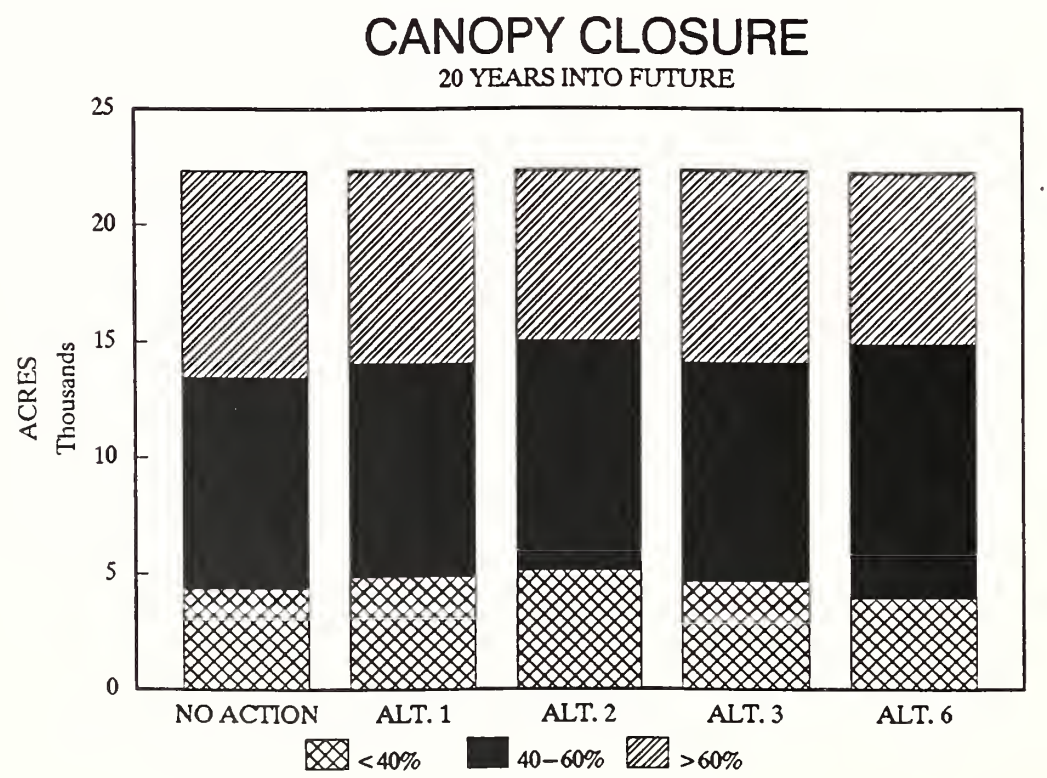


**Figure 17**

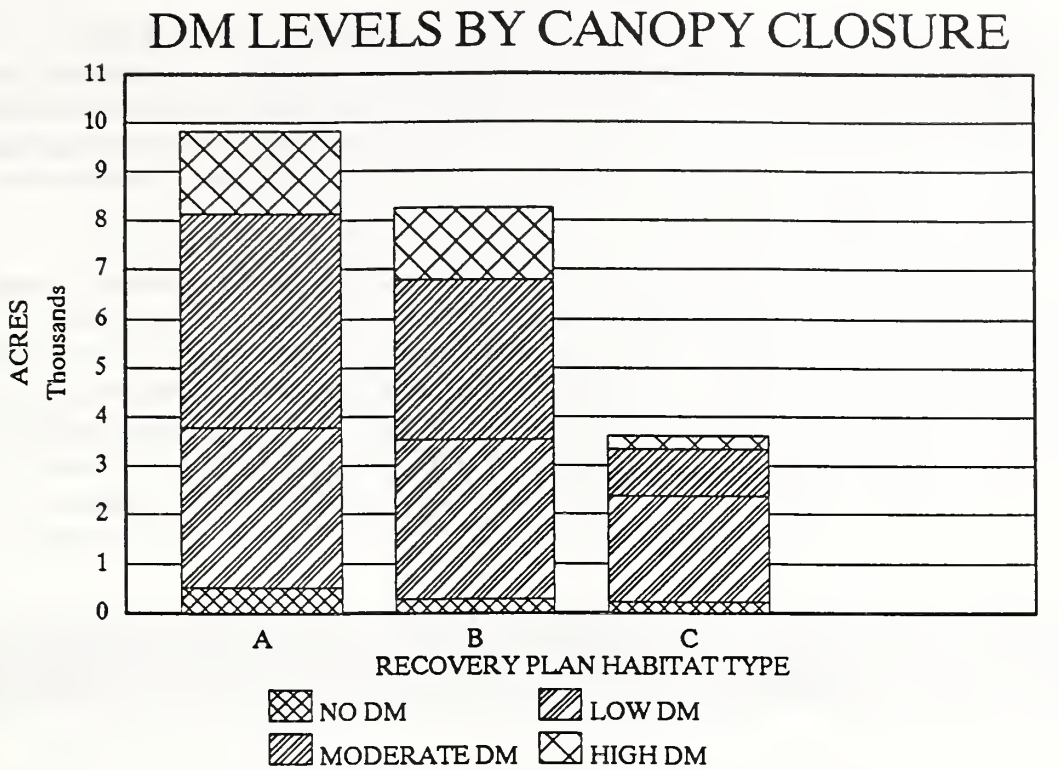
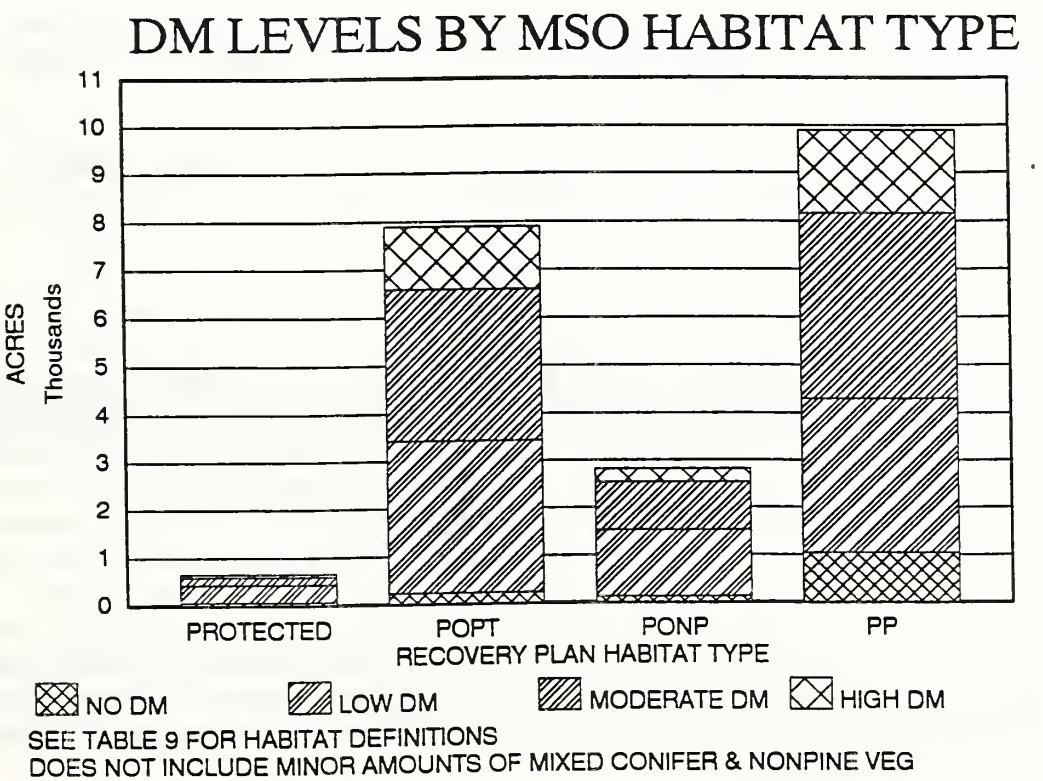



**Figure 18**



### Conclusions

Changes in the vegetative structures occur as the trees grow. Vegetative structures, in absence of logging, fire, or natural agents, are projected to increase in density until the effects of dwarf mistletoe exceed the trees' capacity to outgrow the infections. At that time, which is estimated at between 30-60 years, stand densities (and canopy closures) are projected to decline. The long-term projections are based on known and often documented effects of dwarf mistletoe on individual trees in combination with extrapolations from long term studies, particularly a 32-year study at the Grand Canyon.

Short term effects on old growth, uneven-aged structure, and dense canopy are very minimal, except for the collective reduction of growth on ponderosa pine. As dwarf mistletoe infestations continue to increase, old growth, uneven-aged structure, and dense canopies cannot be sustained. The time frame at which stands older stands (generally VSS4+) with moderate to light mistletoe infections are able maintain old growth, unevenage structure, or dense canopy, is uncertain. Intuitively, knowing the well-documented effects of dwarf mistletoe on individual trees, and knowing the high infestation levels and severity within Pocket/Baker, there appears to be serious consequences in the long term.

## ISSUE #4:
## Decline of Aspen in the Ecosystem

### CONSEQUENCES IN ASPEN SITES

### Alternatives 1, 2, 3, 6

The existing patches that are treated and burned will be restored and most likely increased in size. Coupled with other aspen, maple, and oak locations, the restored aspen patches will contribute to the overall fall color patterns and viewing enjoyment.

Due to the small size of aspen patches even after rehabilitation of existing ones, the value of these patches to wildlife (particularly birds) is minimal. However, restoration of these patches serves as a building block for future expansion.

Experience on the Coconino National Forest (Sheppard and Rolfe 1995) indicates that burning is not a necessity in establishing saplings and seedlings of aspen, but fencing is. Therefore, fire will occur if the unit is part of a larger planned burning block, or if seedlings are not being established. Elk-proof fencing will occur on all treatment areas.

The proposed aspen regeneration treatment (which is common to all action alternatives) is not expected to present an affect to red squirrels, Abert squirrels, and the old-growth component. Improvements to the overall quality of the landscape is expected from the treatment. These improvement would include improved tree structural and species composition; future development of snag habitat which would provide a missing habitat component necessary to those species which use only aspen snags for nesting and cover; provide improved cover with the establishment and maintenance of dense aspen regeneration; provide a missing vegetative environment important as habitat for species such as the turkey; and provide increased foraging opportunities for the goshawk and MSO through development of additional and diverse prey species habitat conditions.

### Alternatives 4, 5

Aspen will continue to decline. Aspen regeneration when it occurs will be heavily grazed by elk. Pine will continue to invade the aspen patches affecting the vigor of remaining aspen. Future habitat diversity would be lost as these inclusions die out.

## COMPARISONS, CONCLUSIONS, AND MITIGATION (Issue #4)

### Comparison of Alternatives

The following lists the units of measure that were selected to measure attainment of project objectives and resolution of issue #4.

a. Amount of area that will be restored to aspen.
**Measure:** Acres of aspen treatments (see following narrative).

### Conclusions

Short of a wildfire in these sites, no action will result in these patches dying out. Restoration of aspen on as much as 60 acres by cutting out most of the pine and mixed conifer (alternatives 1, 2, 3, 6), particularly the overtopping younger trees, will result in renewal of aspen sites and future habitat diversity. The action alternatives provide for the restoration of aspen sites within Pocket/Baker and future habitat diversity.

### Mitigation

- Retain some pine and mixed conifer species, especially old growth trees. This has been shown to provide added diversity well used by wildlife (USDA 1996a).

- Fence treatment areas with elk proof fencing.

# ISSUE #5:
# Increasing Demand for Recreation Activities

## CONSEQUENCES IN THE PONDEROSA PINE COMMUNITY

### All Alternatives

Compaction of soils in meadows from recreation activities is already minimized with the rehabilitation of Dickerson Flat and 5 Mile Lake (ripping compacted soil, road relocation, and fencing). Compaction in dispersed camping sites will continue resulting in very limited and localized compaction.

## CONSEQUENCES ON PEOPLE

### All Alternatives

Recreational activities will continue. The Cinch Hook snowplay area will remain closed pending resolution of safety issues regarding traffic along State Highway 87. The temporary closure of road 608 will continue pending resolution of safety and historic structure protection. Closure of established recreation locations affects those who use the given sites. Closure of loop roads reduces their recreational value due to people having to double back over the same stretch of road. Closure of non-loop roads decreases vehicle access, but increases nonmotorized settings for recreation. Generally, the amount and type of roads being closed/obliterated have minimal effect on recreation opportunities, though the net result is the increase in nonmotorized recreation settings.

## COMPARISONS, CONCLUSIONS, AND MITIGATION (Issue #5)

### Comparison of Alternatives

The following lists the units of measure that were selected to measure attainment of project objectives and resolution of issue #5.

a. Amount of dispersed recreation area rehabilitated.
**Measure:** Narrative of proposed projects and accomplishments (see above).

b. Direction for management of Cinch Hook and road 608.
**Measure:** Narrative on disposition of management direction (see below).

### Conclusions

There is no difference within any of the alternatives, because these activities will occur since they are governed by projects that will be studied and/or implemented regardless of which alternative is selected and implemented in the Pocket/Baker analysis. The Pocket/Baker analysis served to provide a landscape view of the issues associated with these projects (i.e. Cinch Hook recreation area, Forest Road 608 rehabilitation, and meadow restoration in Dickerson Flat, 29-Mile, and Five-Mile).

# ISSUE #6:
# Watershed and Safety Problems With Transportation System

## CONSEQUENCES ON WATER QUALITY

### Alternatives 1, 2, 3, 6

Additional changes will be made to RATM improving the water quality through road obliteration, closure, or reconstruction. These changes come about as a result of reviewing the Best Management Practices as they relate to roads (56, 66, 92, 104, 125). The "most practical and effective means of controlling nonpoint pollution sources from forests and rangelands is through the development of preventative or mitigating land management practices, generally referred to as Best Management Practices (BMP's), and to ensure control of such nonpoint sources through implementation of BMP's" (Intergovernmental Agreement between the State of Arizona and the USDA Forest Service, Southwestern Region). BMP's are a practice or a combination of practices that are determined to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals (FSH 2509.22).

Alternatives 1, 2, 3, and 6 will provide for the improvement of stream courses by removal/closure/obliteration of nearly 40 miles of road segments within the stream courses or their filter strips. This represents an 18 miles of roads to be treated in addition to the approximate 32 miles of existing decisions. Road density after implementation of all RATM decision will be just under 2 miles per square mile.

### Alternatives 4, 5

Existing RATM decisions will be implemented. Additional changes to previous decisions to improve road management will not occur. Nonpoint pollution will continue from roads that are located in filter strips or in stream courses.

Alternatives 4 and 5 provide for stream course improvement from decisions previously made. There are about 18 fewer miles of roads treated. Road density after implementation of all current RATM decisions will be just over 2 miles per square mile.

## CONSEQUENCES ON THE SAFETY OF PEOPLE

### All Alternatives

Hazardous conditions from dense tree conditions or individual tree characteristics (lean, rot, etc.) have been identified. The Arizona Department of Transportation and the Forest Service will work jointly on removing such hazards regardless of the alternative selected. Alternatives 1, 2, 3, and 6 will provide for safer highway conditions along 7 miles of Highways 87 and 260. Alternatives 4 and 5 results in the Arizona Department of Transportation to independently begin a study on highway safety and delays implementation of such a project. This delay may or may not have future implications in vehicle accident/fatality numbers.

The Federal Highway Administration and the U.S. Forest Service have a new memorandum of understanding which governs tree removal within the highway right-of-way. Actions not undertaken through this analysis will be studied by the highway administration in the future.

The resulting effects on the roadside vegetation can best be described as similar in appearance to the Highway 180 project north of Flagstaff (jointly done by ADOT and the Coconino National Forest). The amount of trees removed will reduce ice patches on the roadway, provide snow removal zones, and increase the visibility and road shoulder safety. Due to the numerous drainages and steep embankments, there are a number of areas along the highway that will not be treated.

## CONSEQUENCES ON GENERAL WILDLIFE HABITAT

### All Alternatives

Activities proposed under soil and watershed management (which is common to all action alternatives) are not expected to present an affect to the following habitat components evaluated in this document: old-growth structural features, cover (provided by trees), turkey roost (structural feature), and overall VSS.

The proposed obliteration or closure of the approximated 40 miles of the roads are likely create a positive affect for the remaining habitat components, and for the species and their habitats evaluated in this document. The reduction in the amount of roads are expected to improve habitat effectiveness through the reduction of disturbance from vehicle access for all the indicator species addressed in this document. Elimination of vehicle traffic on these roads is expected to allow the reestablishment with herbaceous vegetation, which would in turn supplement the existing forage base for deer, elk, and turkey. Reduced access is also expected to reduce the potential loss of snags and Gambel oaks to illegal woodcutting.

The two recreational activities (restoration and opening of Forest Road 608 and activities associated with the Cinch Hook snowplay area) are not expected to impact the habitat components, and the species and their habitats of any wildlife species addressed in this document (164).

## COMPARISONS, CONCLUSIONS, AND MITIGATION (Issue #6)

### Comparison of Alternatives

The following lists the units of measure that were selected to measure attainment of project objectives and resolution of issue #6.

a. Amount of road and watershed conflicts resolved.
**Measure:** Miles of stream courses improved (see narrative above).

b. Amount of area where roadside highway hazards are reduced.
**Measure:** Miles of roadside hazard reduction (see narrative above).

### Conclusions

Projects proposed for the action alternatives (1, 2, 3, 6) provide the greatest amount of improvement for downstream water quality. The consequential reduction in access provides for the least access for illegal firewood cutting activity and the least disturbance access to wildlife.

The action alternatives also provide more immediate safety for Highways 87 and 260.

### Mitigation

- Implement Best Management Practices (BMP's) for road work activities to assure water quality is not being impacted significantly.
- Any seeding done along Highways 87 and 260 will utilize species not attractive to deer and elk.
- Stumps heights will be cut flush with the ground in the immediate foreground view from the highway.
- Residual material left in piles within 200 feet of Highways 87/260 after the burning will be scattered.
- Skid trails visible in the immediate foreground of the highway will be backbladed, seeded, and/or restored with slash.

## MISCELLANEOUS EFFECTS
## (Not Addressed in the Above Issues)

### AIR QUALITY

#### All Alternatives

Potential impacts to air quality is expected from burning. Permissible levels of smoke which will meet air quality standards are determined through monitoring and regulation of burning by the Arizona Department of Environmental Quality. Therefore, there are no significant effects to air quality.

### SOIL AND WATER QUALITY

#### All Alternatives

Contribution to future soil productivity occurs with the harvest activities. Because the generated slash will remain on the site, soil will be protected from heavy rains and drying winds; new ground cover plants are protected from the natural elements and grazing; and the woody, organic material is available to improve soil productivity. Potentially, whole-tree skidding may remove a significant portion of the harvest slash into concentrated piles at the landings. Implementing standards for residual coarse woody

debris at 5-10 tons per acre will assure that sufficient slash will be left on the site for soil protection and productivity enhancement.

There will be a short term increase in on-site soil movement due to the disturbance factors of harvesting and prescribed burning. With the implementation of soil conservation practices or Best Management Practices, the mechanical activities associated with forest harvesting are not considered detrimental over the long term.

No treatments are proposed. Soil productivity will increase over time from natural deposition of organic matter, but the improvements will be slower without the benefits of the harvesting slash.

## PEREGRINE FALCON

### All Alternatives

Since the nest sites are not within the Pocket/Baker ecosystem, there will be no direct disturbance to the nest site. Prey habitat which consist mostly of meadows and riparian areas are not impacted by harvest or burning activities. The restoration of the pinyon-juniper grassland will benefit the peregrine. Burning of treated pinyon-juniper will occur within 1/2 mile of a peregrine nest site during the breeding season (March 1 to August 31). This is necessary in order to achieve a satisfactory burn. If during monitoring of the nest sites, the nest is active, then burning will be deferred. No other disturbing activities will occur during the breeding season.

## LITTLE COLORADO SPINEDACE

### All Alternatives

Activities which are conducive to reducing sediment will have positive effects on the downstream spinedace habitat.

The greatest impact currently affecting the watershed which is upstream from known spinedace is road 9362T which parallels the stream course in Potato Lake Draw, and in an associated tributary. A segment of the road in Potato Lake Draw, upstream from Potato Lake, was closed in 1994. The portion of road above and below the closed segment is more than likely contributing to an undesirable situation in the upper end of this watershed. All action alternatives propose a RATM change to close the rest of this road. A sizable livestock exclosure, in Potato Lake Draw below Potato Lake, has been in place for a number of years. It is felt this exclosure is providing an effective filter for downstream flow.

## TE&S SPECIES

### All Alternatives

Of the 37 potential threatened, endangered, and sensitive species which are known to occur or to potentially occur within the Pocket/Baker area, only 10 species were considered to be potentially present. Those species are American peregrine falcon, Mexican spotted owl, Little Colorado spinedace, Chiricahua leopard frog, Arizona leatherflower, northern goshawk, northern leopard frog, flammulated owl, Tusayan flame flower, and Arizona cinquefoil (165).

The peregrine falcon, Mexican spotted owl, Little Colorado spinedace, and northern goshawk were addressed in previous sections of this document. The following summarizes the findings regarding the remaining species.

Limited surveys have not found any presence of the Chiricahua leopard or the northern leopard frogs.

Flammulated owls have been heard during surveys for the Mexican spotted owl at a total of 18 locations. An obligate secondary cavity nester, the owl prefers open vegetation and snags. Both snag and open vegetation habitat are minimally affected by proposed actions.

A review of District surveys or the Arizona Game and Fish Department Heritage Data Management System did not produce any known or historic locations for the Arizona leatherflower or the Tusayan flame flower. There is one known population of Arizona cinquefoil in a drainage on the northern boundary of the Pocket 10K. This stand surrounding this site is proposed for broadcast burning. No burning is expected within the drainage. Though potentially impacted by livestock grazing, this population has not been impacted by past grazing practices.

A study of the proposed projects has determined that although individuals of Chiricahua leopard frogs, northern leopard frogs, flammulated owls, and Arizona cinquefoil may be impacted by certain proposed activities of each alternative, the impacts are not likely to contribute to the trend toward Federal listing, or further loss of viability (165).

A determination of "may impact" was rendered for the Arizona leatherflower and the Tusayan flame flower due to the lack of information. However it is unlikely that these plants occur within the Pocket/Baker area (165).

## RED SQUIRREL

### All Alternatives

No harvest activities will occur in mixed conifer stands, though some harvest activity will occur in a few stands with mixed conifer inclusions. Burning will occur in some mixed conifer stands and inclusions.

## CULTURAL RESOURCES

### All Alternatives

An inventory has been completed for the 20K. Known sites will be avoided from disturbing activities.

## RECREATION OPPORTUNITY SPECTRUM

### All Alternatives

With predominantly thins from below, vegetative structure will tend toward larger diameter residual stands which enhances the more primitive range of the spectrum. There is no timber harvest activity in Semi-primitive Motorized class in Alternative 3. Alternatives 1 and 2 propose a block of about 400 acres with a high percentage of group shelterwood seed cuts. This is necessary to keep a highly infected dwarf mistletoe stand from completely deteriorating at which point it would detract from the SPM setting anyway. Planned road construction is within the Roaded Natural class.

## WILDERNESS

### All Alternatives

There are no construction activities or harvesting activities within the wilderness or adjacent to the wilderness boundary. Viewsheds from the wilderness (which is in the canyon) are not affected.

A discretionary review on an appeal of the Diamond Bar Allotment Management Plan by the Chief of the Forest Service (2-7-96) concluded that Congressional Grazing Guidelines direct the consideration of all resource conditions and values including wilderness, even if grazing had been established prior to the designation of the wilderness.

Livestock graze on only 633 of the 10, 477 acre Fossil Springs Wilderness. The portion grazed is on a "flat", (a point), that receives light, if any, recreational use. There are no trails or wilderness attributes that are significantly affected by the grazing activity as the point is a mere extension of the pinyon-juniper vegetation type transitioning from the ponderosa pine forest. The outstanding features of the Fossil Springs wilderness is the canyon topography below and to the east of Pocket Point. Livestock do not graze in the canyon. Stock tank maintenance (done by mechanized equipment) is authorized because livestock grazing was established prior to the wilderness designation. There is no other reasonable nonmotorized method for maintaining Pocket Point tank. The tank is also within the "flat" and is at least 1/4 mile from the edge of the canyon. A virtual one-time mechanical disturbance (noise) combined with the relative nonuse by recreationists of this portion of the wilderness results in no significant impacts to the wilderness resource from livestock grazing. The benefit of the tank maintenance is to provide a water source not only for livestock management, but also for wildlife in a large terrain without any other water sources.

## ECONOMICS

### All Alternatives

Table 19 indicates the present net value of each alternative by individual projects.

Table 19: Present Net Value of Individual Projects

| PROJECT | ALTERNATIVE | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Watershed Improvements | -23,957 | -23,057 | -23,957 | 0 | 0 | -23,957 |
| Timber Harvest | 971,710 | 1,160316 | 697,324 | 0 | 0 | 890,808 |
| Range Improvements | -64,613 | -64,613 | -64,613 | 0 | 0 | -64,613 |
| Prescribed Fire | -414,781 | -414,781 | -414,781 | 0 | 0 | -414,781 |
| Road Improvements | -43,953 | -43,953 | -43,953 | -9,477 | -9,477 | -43,953 |
| Aspen Treatments | -22,225 | -22,225 | -22,225 | 0 | 0 | -22,225 |
| | | | | | | |
| **TOTAL PNV** | **402,181** | **590,787** | **127,795** | **-9,477** | **-9,477** | **321,279** |

### MITIGATION (Miscellaneous Effects)

The following mitigation measures offset any significant impacts for the miscellaneous effects mentioned above:

- With the implementation of Best Management Practices and coarse woody debris standards of 5-10 tons per acre, there is no significant effect to the productivity of the soil from timber harvest operations, road obliteration/closure/reconstruction/construction, and prescribed fire activities.

- Red squirrel middens will be protected from prescribed fire by providing about 1/10th acre unburned buffer zone around them. Fire retardant foam will not be used directly on the middens because the site is a food cache.

- To respond to the objectives defined by Congress in the Federal Water Pollution Control Act and by the State of Arizona as defined in the Arizona Environmental Quality Act (1986), the Forest Service and the State of Arizona have entered into an intergovernmental agreement. As a result the Forest Service agrees to develop and utilize Best Management Practices (BMP) for each project or plan. The BMP's are designed to limit nonpoint source pollution from activities such as prescribed burning, timber harvest operations, and road construction. These BMP's are standard operating procedures.

- Standard operating procedures include consultation with the State Historic Preservation Office to receive archaeological clearances prior to the inception of any of the Pocket/Baker projects.

# CHAPTER 9: MONITORING PLAN

This chapter describes the:

- actions taken to assure projects are implemented according to the specifications in this analysis.

## MONITORING

The monitoring plan for the Pocket/Baker 20K area is intended to provide a way to measure changes to the ecosystem when the selected management alternative is implemented. The monitoring results will be compared to the desired conditions discussed in Chapter 1 of this document, and to the expected results presented in Chapters 2 and 8. With this information we will know if we are meeting the Project Objectives listed in Chapters 1 and 2, to what degree, and whether "Adaptive Management" is needed to better meet our desired conditions for the Pocket/Baker 20K area and surrounding impacted areas. If we determine our actions are not having the desired results, changes will be made in how, when, or where implementation takes place, or the approved action may be stopped.

Items to be monitored include livestock grazing, timber harvest treatments, road closures, and prescribed fire. Units of measure for monitoring reflect standards and guidelines in the Forest Plan or noted if different. The following monitoring processes already occurring will help in evaluating the impacts and/or effectiveness of the project proposals.

- The Coconino National Forest Plan monitors the following as it pertains to the Pocket/Baker area: Effects associated with timber harvesting and livestock grazing: turkey, red squirrel, elk/deer, Abert squirrel, hairy woodpecker, pygmy nuthatch, yellow-bellied sapsucker, plain titmouse, antelope and cinnamon teal habitat capabilities (pages 211-214); grazing impacts/effectiveness by measuring actual use, capacity, range condition and trend, forage and improvement conditions (pages 216-217); timber harvest effects/effectiveness by measuring reforestation success, silvicultural assumptions and practices, productivity, acres harvested by prescription, size of openings, yield projections, and evaluation of suitable timber lands (pages 218-222); road obliteration and water quality effectiveness by measuring road densities and compliance with water quality standards (page 223); growth and mortality caused by insects and diseases (page 225); and air quality (page 225).

- Permanent forest plots were established this year by the Intermountain Forest and Range Experimental Station for the purpose of permanent monitoring of both overstory and understory vegetation, wildlife attributes, and soil condition. A number of these plots are in and adjacent to the Pocket/Baker area. These plots will monitor the cumulative effects of timber harvesting, livestock grazing, and prescribed fire.

- Spotted owls are being monitored through a specific protocol. The MSO Recovery Plan has made additional recommendations.

- Since cumulative effects are manifested in current conditions, the mere inventory and comparison to past conditions of each project area constitutes a form of monitoring.

- Monitoring for some projects are standard operating procedures: for example, range inspection reports, sale administration reports, regeneration surveys.

The following are specific monitoring items for Pocket/Baker.

## Methods

Methods for monitoring include photographic documentation, field observations, and physical measurements. In many cases, monitoring can be accomplished as a multi-resource effort, which continues the interdisciplinary effort toward proper management of the Pocket/Baker 20K and surrounding areas. Monitoring will be conducted by Forest Service Silviculture, Pest Management, Range, Fire, Recreation, Wildlife, Watershed/Soil and Engineering personnel. The range permittees will help conduct the monitoring for biological planning (grazing moves) after thorough training by District Range personnel.

### Photographic Documentation

Set up permanent photo points annually each fall at specific locations to subjectively monitor the following items prior to implementation of the selected alternative. This form of monitoring has been ongoing on numerous livestock grazing sites since the Red Hill Demonstration project:

- availability of seedheads on grasses for wildlife after livestock have moved to other pastures;
- ground cover - condition, amount, diversity;
- bare ground/interspace fill-in;
- soil movement/erosion;
- overstory vegetation - density, burning success (% kill on target species plants, resprouting), encroachment over time; and
- fire behavior - burning success, spread, control, burning conditions.

### Field Observations

Visit the areas to monitor, using ocular estimates and documentation, prior to and during implementation to be sure project is properly executed, and again at the intervals listed for each monitoring effort.

- Effectiveness of all road closures and obliterations in preventing motorized vehicle use and reducing watershed and soils concerns. Monitor for evidence of motorized vehicle use on the roads and/or driving around barriers; healing of roadbeds - revegetation, soil movement, compaction.

- Intensity of burn and resulting consumption of ground cover (litter and humus) for the amount of residual soil protection. Monitor for percent ground cover prior to and after burning.

- Impact of livestock grazing on vegetation, soil, and watershed conditions. Monitor length of graze period, season of use, percent use during graze period, plant recovery, ground cover density, diversity, condition, interspace fill-in, soil movement and compaction.

**Measurements**

Take measurements with appropriate equipment or techniques at the intervals listed for each monitoring effort.

- Intensity of burn and resulting consumption of ground cover (litter and humus) for impacts to the soil resource by placing devices that measure heat intensity under the soil at selected points and estimate percent consumption of ground cover within a specified area surrounding the point prior to burning; review data after each burn. Estimate percent ground cover again in the fall (after summer rains), spring, and 1 year after the burn (after summer rains).

- Ground cover vegetation and range conditions (Parker 3-step range cluster transects, including species diversity, ground cover, plant vigor, range condition, trend and erosion index with close-up and horizon photographs). Re-establish two range cluster transects already present in this area. Re-read the clusters in 1995 and make general comparisons of the 1970 and 1983/84 data. Establish 4-5 new range clusters in 1995 in an area with heavy forest fuels, potential bunchgrass re-establishment area, pinyon-juniper burn area, 29-mile Lake (west meadow), and possibly at Garden Springs and an aspen regeneration area. Monitor prior to implementation of the selected alternative and every 5 years if possible for immediate trend data. General range cluster guidelines call for reading the clusters every 10 years. Two people can read 2-3 clusters in one day.

- Plant growth rates and livestock performance to determine livestock graze periods throughout the grazing season. Pastures will be grazed up to 20 days during periods of fast plant growth and up to 30 days during periods of slow growth. Monitor plant growth and speed up or slow down livestock movement through pastures with plant growth periods. Livestock performance will be monitored by observing their behavior (i.e., crowding the fence, grazing all day and not ruminating by 9-10 am, travelling excessively, seem aggravated and not content. If these signs are observed, the livestock will be moved to the next pasture before the 20 to 30 day graze periods are met. If graze periods are shorter than scheduled the livestock will move back to the allotment on the Tonto National Forest below the Mogollon Rim earlier than planned. Monitor throughout the grazing season; a range conservationist and the permittee will monitor these factors.

- Observe and document problems of livestock gates, especially along State Highway 87, to determine where or if cattleguards are necessary throughout the grazing season; District range conservationist, range permittees and District fire prevention personnel will monitor the gates.

- Continue elk/cattle utilization monitoring to determine actual use throughout the growing season using leaf lengths. During late May, mid-July, late October, and before and after livestock grazes. Range personnel will continue this effort (approximately 1 hour per cage area.

- Field check all stands marked for tree cutting to be sure the tree size and pattern of cutting meets the prescription objectives. These inspections are documented by the silviculturist writing the prescriptions. Monitor activities during the harvest, and conduct post-harvest surveys to insure objectives are met.

- Monitor smoke plume according to AZ DEQ smoke management guidelines. Complete post-treatment fuel surveys to measure fuel objective accomplishment.

# CHAPTER 10: PREPARERS/CONSULTATION

This chapter describes the:

- persons who were on the interdisciplinary team and participated in the preparation of this analysis and documentation.
- opportunities for public involvement and consultation with other agencies.

## STUDY TEAM/PREPARERS

The following persons participated in the analysis and preparation of this environmental impact statement. The fields of expertise are noted; personnel listed are from the Coconino National Forest unless otherwise designated:

| | | | |
|---|---|---|---|
| Steve Barth | Roads/OHV Recreation | Ed Paul | Silviculture |
| Elizabeth Blake | Writer/Editor | Karen Peck | Fuels Management |
| Julie Creed | Transportation | Rakell Rethlake | Wildlife |
| Mark Davis | Archaeology | George Robertson | Soils/Hydrology |
| Mary Lou Fairweather | Pest Management | Debbie Steen | Recreation |
| Richard Fleishman | Watershed | Mark Whitney | Wildlife |
| Lynn Freed | Database Management | Jill Wilson | Forest Pests |
| Jerry Gaither | Timber Management | Mark Wirtenen | Wildlife |
| John Gerritsma | Team Leader, Writer/Editor | Cathy Zettler | Fire Management |
| Bruce C. Greco | District Ranger | | |
| Mike Hannemann | Range Management | | |
| Lisa Hanson | Archaeology | | |
| Michele James | TE&S Species (USFWS) | | |

Copies of the FEIS were sent to the following agencies and interested publics:

| | | |
|---|---|---|
| US Dept. of Agriculture | Mr./Mrs. Dennis Griggs | Forest Guardians |
| Apache-Sitgreaves NF | Nat. Res. Cons. Service | Robert Hudson |
| AZ. Dept. of Environ Quality | Mr./Mrs. Charles Allen | Amelia Jaskulski |
| AZ. Dept of Game and Fish | AZ. Dept. of Transportation | Stone Forest Industries |
| American Fisheries Society | N. AZ. Audubon Society | Coconino Sportsmen |
| SW Forest Alliance | Forest Conservation Council | Barbar Managan |
| Karen Applequist | Gila County Dist. #1 | Mr./Mrs. Jack Meyers |
| Robert Bemindt | SW Center for Biodiversity | John Parsons |
| Jerry Brown | Verde Valley 4-Wheelers | Mr./Mrs. Wendell Randall |
| Mr./Mrs Glenn Carlson | USGS Water Resources | Friends of the Coconino |
| Harold Dunnagan | Lufkin Hunt | Mr./Mrs Dean Roberts |
| Charles Ester III | Bruce Johnson | Dr. Merri Schall |
| N. AZ. Natur Conservatory | Pine-Strawberry CoC | Ariz. Loggers Assoc. |
| Tony Goen | Anita McFarlane | Coconino County |
| Bill Acheson | Ron McMenamin | Town of Camp Verde Mayor |
| Richard Bansberg | Yavapai-Prescott Indian Tribe | Maricopa Audubon Society |
| Rocky Mnt. Elk Foundation | Mr./Mrs. Robert Rasmussen | Coconino Forest Watch |
| Jess Chinn | AZ State Parks | Doris Stapley |
| Rick Erman | Jerry Huddlestun | Kim Wheeler |
| James Evans | US Fish and Wildlife Service | Grand Canyon Trust |
| Sierra Club Plateau Group | US Dept. of Interior | Logan, Simpson & Dye |
| Mr./Mrs. David Steniger | Kaibab NF | Prescott NF |
| Precision Pine and Timber | North Kaibab RD | Payson RD |
| US Dept. of Interior | Envir. Prot. Agency | |

## CONSULTATION WITH OTHERS

One of the great benefits of this analysis was having a member of the Fish and Wildlife Service on the Interdisciplinary Team. At a time when management direction was evolving with the release of the Draft MSO Recovery Plan, the team benefitted immensely from this partnership. Peter Jagow of the Arizona Department of Environmental Quality (ADEQ) provided water quality information in regards to numerous transportation system conflicts. The Arizona Game and Fish was contacted early in the process and provided a number of different wildlife expertise from time to time. Representatives from the State Historic Preservation Office and State Parks provided invaluable assistance regarding historical structures on Forest Road 608. The Payson District of the Tonto National Forest provided additional personnel in dealing with prescribed fire on the Rim and management coordination for Forest Road 608. The Arizona Department of Transportation identified hazards along State Highway 87.

Members of industry, off highway vehicle clubs, environmental groups, and the general public participated in a number of field trips and meetings.

The Coconino National Forest provides a list of projects in the NEPA schedule to a general interested persons list. This schedule is updated every 6 months. The following other opportunities for public involvement were available during the analysis process:

Table 20: Public Involvement

| INVOLVEMENT ITEM | DATE | HOW CONTACTED |
|---|---|---|
| | | |
| Initial Scoping Meeting | August 15-17, 1989 | Letter - General Public List |
| IDT Meeting | January 19, 1990 | Selected publics via phone |
| Project Notice Posters | October 23, 1991 | Posted around project area |
| Proposed Action - Pocket | June 24, 1992 | Letter requesting comments |
| | | and field trip participants |
| Conference re: Pocket | September 9, 1992 | Selected publics via phone |
| Informal Field Contacts | July 3, 1993 | Campers in the area |
| Invitation for field trip | October 26, 1993 | Letter - General Public List |
| Status Letter for project | December 20, 1993 | Letter - General Public List |
| Proposed Action - Pocket/Baker | February 1, 1994 | Letter requesting comments |
| Road 608 Field Trip | May 5, 1994 | OHV publics via phone |
| Project Status Letter | September 12, 1994 | Letter requesting verification of continued involvement |
| Request for Field Trip Participation | October 12, 1994 | Via phone for publics who had expressed interest |
| Notice of Intent | May 5, 1995 | Federal Register |
| Notice of Availability (DEIS) | June 2, 1995 | Federal Register |
| Draft EIS | June 2, 1995 | Letter/DEIS - General Public Mailing List |

# Appendix A

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#156

YAVAPAI
PRESCOTT ◆ INDIAN ◆ TRIBE

June 06, 1995

159

Mr. Bruce C. Greco
District Ranger
Long Valley Ranger District
HC 31, Box 68
Happy Jack, Arizona 86024

Refer to: 1950

Dear Mr. Greco:

We have reviewed your comments about the Draft Environmental Impact Statement noted in your letter of May 30, 1995.

1-1 The Yavapai-Prescott Tribe is primarily concerned about the protection of Cultural Resources in that portion of the Pocket-Baker area that lies within the traditional territory of the Yavapai. We assume that any proposed land disturbment, especially controlled burns, be monitored by Coconino National Forest Archaeologists. We know that burning, even that which is controlled, can cause potential damage to archaeological sites and the surface artifacts that might be present on them.

Sincerely,

Robert C. Euler

Robert C. Euler, Ph.D
Tribal Anthropologist

RCE.lj.03

# APPENDIX B

## RESPONSE TO COMMENTS ON POCKET/BAKER DEIS

1-1 We have included in the FEIS a discussion on standard operating procedures. These procedures include consultation with the State Historic Preservation Office to receive archaeological clearances prior to the inception of any of the Pocket/Baker projects.

Southwest Center For Biological Diversity

June 13, 1995

U.S. Forest Service
Long Valley Ranger District
HC 31 Box 68
Happy Jack, AZ 86024
ATTN: Pocket/Baker

Attached are some comments regarding the Pocket/Baker Ecosystem DEIS:

The DEIS is deficient in numerous respects and in general is poorly written an devoid of the needed data to make a coherent decision about the future of the area.

2-1 1. The proposed action violates the Draft MSO recovery plan. The action should be modified so that it complies with the Recovery Plan. To proceed further without making the modifications is not in the spirit of ecosystem management. The Forest Service is mandated by law to implement recovery plans for listed species, thus the proposed action violates not only the ESA but also relevant Forest Service policy.

2-2 2. The proposed action should be modified to eliminate all harvest of yellow-pines as they are too scarce to be further removed. Large mistletoe infected trees are optimal nesting, roosting and foraging habitat for many wildlife species and very important for snag recruitment. If the spread of mistletoe is a concern sanitation donuts around infected trees can be used. There is no excuse whatsoever to harvest large trees on this 20K area for any ecological or ecosystem reason.

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2-1 The Recovery Plan for the Mexican Spotted Owl has been completed and all alternatives are evaluated using this plan. Comments made to the Pocket/Baker DEIS were during the period of the Draft Recovery Plan. Where comments are still valid under the final Recovery Plan, discussion is presented; otherwise, comments are moot and not considered further.

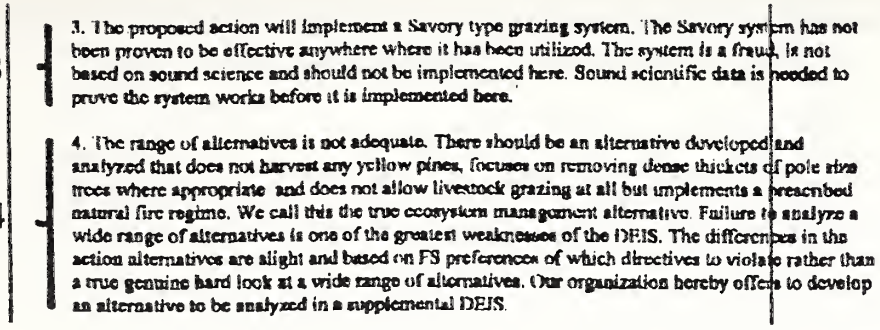
The Recovery Plan states "it is neither self-implementing nor legally binding" (MSO Recovery Plan, Volume 1, Page 1). It is a guiding document in conducting various processes required under the ESA, such as consultation. Recovery plans are not laws and, therefore, cannot be "violated".

Projects do not necessarily need to meet Recovery Plan guidelines. Disclosure of the effects, however, is required (in decision documents governed by the National Environmental Policy Act) and in consultation with the Fish and Wildlife Service. Federal laws (ESA, NFMA, NEPA) require *consideration* (Volume 1, Page 124) of endangered and threatened species in program implementation. The ESA requires consultation with the Fish and Wildlife Service. That consultation has been concluded. NFMA requires identification and conservation of endangered and threatened species, and the prevention of destruction or adverse modification of critical habitat. A means for compliance with this regulation is the consultation process with the Fish and Wildlife Service (see. 219.19 (3)). NEPA requires the preparation of an EIS for actions which result in significant impact; hence this EIS.

2-2 Inventory data for trees over 18 inches DBH was done only for the Baker 10K and only where they occurred in groups of three or more. The data shows approximately 0.4 groups per acre with an average 5 trees per group. When expanded to the Pocket/Baker ecosystem, the figure indicates approximately 46,000 large trees present (exeludes 18 inch plus DBH as individuals, so the actual total is higher than the estimated 46,000).

The removal of large trees (between 18 and 24 inches DBH) is slated only where regeneration is threatened with infection from dwarf mistletoe, or trees which pose a safety hazard along highways 87 and 260. The criteria for removal has been illustrated (added to appendix in FEIS). Trees larger than 24 inches that are not a safety hazard along the highways will not be cut. An estimated 300 trees 18-24 inches DBH scattered throughout approximately 5,200 acres will be cut. It is estimated that 1/3 to 1/2 of the estimated trees to be cut are hazard trees along highways 87 and 260. The rest of the trees are within overstory removal units or seed cuts scattered mostly through the Baker portion of the analysis area.

The harvest of 300 trees, many of which are hazard trees along major highways, represents at most 0.6% of the total. We do not feel that this is significant.



3. The proposed action will implement a Savory type grazing system. The Savory system has not been proven to be effective anywhere where it has been utilized. The system is a fraud, is not based on sound science and should not be implemented here. Sound scientific data is needed to prove the system works before it is implemented here.

4. The range of alternatives is not adequate. There should be an alternative developed and analyzed that does not harvest any yellow pines, focuses on removing dense thickets of pole size trees where appropriate and does not allow livestock grazing at all but implements a prescribed natural fire regime. We call this the true ecosystem management alternative. Failure to analyze a wide range of alternatives is one of the greatest weaknesses of the DEIS. The differences in the action alternatives are slight and based on FS preferences of which directives to violate rather than a true genuine hard look at a wide range of alternatives. Our organization hereby offers to develop an alternative to be analyzed in a supplemental DEIS.

2-3

2-4

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2-3 The DEIS referenced a number of data sources (see Chapter 5 in the FEIS) from adjacent or similar allotments that indicate the proposed grazing scheme will increase species diversity, species vigor, and density. This is not a Savory grazing system (i.e. short-duration).

2-4 Alternatives are developed in response to issues. You do not state which issues were overlooked, but rather offer an alternative with a mix of your preferences. Your brief description of an alternative that does not cut yellow pines, harvests only dense thickets where appropriate, and utilizes prescribed natural fire, but no livestoek grazing suggests the following.

Removal of hazard trees along both highways 87 and 260 is a tool for improving the safety of those roads. You do not offer an alternative method in dealing with the hazardous situation, so your suggestion to retain all yellow pines in an alternative was not considered further.

Your preference of a prescribed fire regime without livestock grazing was suggested previously in a letter to the Regional Forester (May 19, 1995) as a means to allow forests to once again "approach their original healthy state". You also implore the Regional Forester to include the role of cattle as a causal and perpetuating factor in forest health problems. Several aspects of that letter were incorporated into this FEIS, mainly the connection between improper livestock grazing and the overabundance of small trees and consequential increased danger from stand replacement fire, insects and diseases.

As noted in the FEIS, the conditions (improper livestock grazing) that resulted in the overstocked condition of the Pocket/Baker ecosystem were set into motion at the turn of the century, with little additional regeneration adding to the "problem" in the last 30 or so years (the Pocket/Baker analysis area has 4% of the acreage in seedling/sapling stage), even though livestock grazing has continued during this period. Also noted in the FEIS is the overwhelming acreage of young to middle-aged forest. Tools to reduce the overstocking of trees in that age/size group include fire and cutting. The removal of cattle will have little effect on the reduction in the young to middle-aged diameter group. Therefore, there is nothing to accomplish by considering the exclusion of cattle in regards to this aspect of the Pocket/Baker ecosystem.

Though you blame livestock grazing for the overstocked condition, you are also adamant about following the recovery plan for the MSO, which seeks to retain and increase dense forest conditions. In your same letter to the Regional Forester, you noted several studies (also referenced in the FEIS) that indicated heavy grazing was the prime factor in explaining the dense tree reproduction. Those studies indicated with photos the dense intermingled forest vegetation structure that resulted. You

2-5 5. The proximity of the area to existing wilderness areas is not analyzed in adequate detail.

2-6 6 The proposed project violates the Land Management Plan (LMP) in that the plan does list these projects in the offering schedules or anywhere else. The plan must be amended for this project to go forward.

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2-7 7. The proposed action reduces the amount of VSS 4&5 to below levels specified in Regional Goshawk direction. It is particularly disturbing that the level of VSS 5 is being reduced as the area is already deficient in VSS 5's and 6's. This is a violation of Regional Policy and is also contrary to the intent of ecosystem management. The DEIS incorrectly determines that the effects to goshawks will not be significant.

2-8 8. The DEIS utilizes selective referencing in regards to the grazing section and makes many assumptions about elk movement that are not substantiated. The DEIS is woefully inadequate in regards to grazing. The monitoring plan in relation to grazing is not specific enough.

2-9 9. The cumulative effects analysis is inadequate and fails to adequately take into account the effects of other nearby past, present and future actions.

2-10 10. The DEIS states in numerous places that the area needs treatment to enhance Mexican Spotted Owl habitat for the long-term. It is stated that because of dwarf mistletoe infection the area will never develop into suitable nest/roost habitat, yet no actual evidence of this is provided. The truth is that most large trees can outgrow and survive mistletoe infection and that mistletoe actually spreads very slowly, is believed to be killed by smoke from fires and is not the apocalypse that the Forest Service and timber industry would have the public believe. The Hawksworth study referenced in the DEIS did not include prescribed fire as a means to control the spread of mistletoe. The Forest Service is relying on selective referencing to buffet its pro-logging point ideology. We suggest the Forest Service worry more about the status of current MSO habitat more than it currently does and less about future habitat than it portends to; which not coincidently fits in well with the Forest Service's pro-logging ideology.



refer to this overstocked condition as "unhealthy". The photos reflect exactly the "unhealthy', dense habitat so well preferred by the Mexican spotted owl.

**2-5** Though it is difficult from your comment to tell exactly what impacts to the wilderness we have failed to address, the section of effects to the wilderness has been expanded in the FEIS.

**2-6** The Forest Plan discloses the allowable harvest in resource allocations. The volume harvested under the Forest Plan to date has not exceeded the allowable harvest. Amendment Number 6 to the Coconino Forest Plan explains adjustments to the offering schedule. The timber sales listed in the 10-Year Offering Schedule that comprise the timber offerings in Pocket/Baker are Strawberry (1992), Middle (1993), and Milk Salvage (1994).

**2-7** Regional goshawk direction is applied to known territories. There are no goshawk territories within Pocket/Baker. Nonetheless, we have included information on potential habitat due to the interest in this species. The DEIS incorrectly stated that VSS 4/5 would be reduced by timber harvest. There are no treatments in VSS 5. (Note that the VSS labels refer to stand conditions and not individual trees.)

**2-8** "Assumptions" regarding elk movements are conclusions from scientific studies as referenced in the DEIS. Comments on grazing are deferred to this and subsequent letters in which you were more specific.

**2-9** Cumulative effects were considered: timber harvests (page 3-20), historical logging/grazing/fire exclusion interactions (pages 3-23 to 3-29), and forest fuel treatments and wildfires (pages 3-30 and 3-31). In addition, cumulative effects from past activities manifest themselves in current conditions. These were listed in pages 3-1 to 3-37. Since you did not list specific effects, we cannot further address your comment.

**2-10** The DEIS cites in excess of a dozen references stating the effect of dwarf mistletoe on ponderosa pine growth and structural development. In addition, there is a lengthy explanation of the trend in stand structure development where dwarf mistletoe plays a significant role. You cite neither contradictory studies nor fallacies in our procedures that demonstrate declining stand densities.

**2-11** 11. The DEIS fails to accurately and adequately asses the projects effects to TES and MIS species.

Thank you for your consideration of our comments. We reserve the right to submit further comments.

Sincerely,

Peter Galvin

Enclosed are some additional comments on the Pocket/Baker DEIS:

My statements regarding the deficiencies of the DEIS should be fairly evident and self-explanatory, so I am confused as to the need for further clarification but I will attempt to do so now:

**2-12** 1. The Draft MSO Recovery Plan is the best available data regarding the MSP both NEPA, FS Policy and the ESA require agencies to use the best available information in decision making. It is evident that the FS is trying to squeeze out more timber by using an outdated set of data. For specifics of how the draft is violated I will refer you to the USFWS letter of 5/10/95 to you regarding Pocket/Baker. I hereby incorporate that letter by reference into our comments.

The DEIS itself says that the preferred alternative will not meet the draft MSO Recovery Plan.

**2-13** In regards to your concerns about single-species management, perhaps when you can meet the legal requirements of managing for one species the MSO you can move on to more ambitious projects. It seems you are stuck in a false philosophical quandary created by you for rhetorical purposes. In essence you create these arguments when a project runs up against a wildlife constraint Just follow the draft MSO Recovery Plan monitor closely and make corrections as needed at later dates.

**2-14** 2. The special permit for baiting trees with pheromone and the stated "difficulties" obtaining them should be discussed in more detail. The effectiveness and long-lived-ness of snags killed by artificial means should be discussed in detail. Your conclusion that these yellow pines need to be removed for timber needs more treatment and analysis. Removing a yellow pine also creates a very short lived snag (i.e. it doesn't).

**2-15** 3. If references show that there is no difference shown between the Savory system and traditional grazing then what is the basis for believe that this system or aspects of it will improve the situation in the Pocket/Baker area when implemented?

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**2-11** A biological evaluation did study the effects of each alternative to all the TE&S and management indicator species. We agree that these were not adequately displayed in the DEIS. Please see Chapter 8 of the FEIS.

**2-12** The USFWS letter you reference were comments to the Pocket/Baker document prior to the release of the draft. As such it is a documentation of concerns from one ID member to the rest of the team. The USFWS comments are reflected in the DEIS. It is inappropriate to address comments made to a working draft prior to the published DEIS. We have no way of knowing which of the 11 pages of comments were not satisfactorily resolved in the DEIS.

**2-13** Thank you for your opinion on single species management.

**2-14** The discussion regarding pheromone baiting has been clarified in the Final EIS.

**2-15** The DEIS referenced a number of data sources from adjacent or similar allotments that indicate the proposed grazing scheme will increase species diversity, species vigor, and density. The proposed system is not a Savory system.

**2-16** 4. An alternative that complies with the Draft MSO Recovery Plan should have been developed and chosen as the preferred alternative. Your chosen alternative violates NEPA, FS policy and the ESA.

**2-17** 5. You have failed to analyze the potential visual effects to wilderness from the project. You have failed to analyze the interrelated effects of livestock grazing allotments that are in both the Pocket/Baker and the Wilderness and how the proposed action will affect and inter-relate with this.

**2-18** 6. The LMP does not include a project of this size and scope and must be amended to allow this project to move forward as planned.

7,8,9,11. I will be discussing these and other items with you on our July 17 meeting.

**2-19** 10. I again refer you to the USFWS 5/10/95 (incorporated by reference) letter which covers your misleading treatment. of mistletoe.

It is very difficult to respond the documents that are laced with judgmental terms in place of scientific objectivity. It is also very difficult to respond to documents which do not have the detail necessary to respond to. I again refer to the USFWS 5/10/95 letter for more specific on the mal-wording and shortcomings of the DEIS.

**2-20** The most distressing aspect of the whole document is that the FS intends to violate the Draft MSO Recovery Plan. If you are still under ID#2 then please enclose information which will state how many acres of each territory have been impacted by past harvest and will be entered by this harvest. The shell game the FS is playing is merely a thinly veiled attempt to cut as much timber as possible. Comply with environmental regulations and your image and respect from the public will dramatically improve.

Thank you for your consideration of our comments.

Sincerely,

Peter Galvin



**2-16** See response to comment **2-1.**

**2-17** The section of effects to the wilderness from livestock grazing has been included in the FEIS (see Chapter 8).

**2-18** See response to comment **2-6**.

**2-19** See response to comment **2-12**.

**2-20** With the completion of the final MSO Recovery Plan and the FEIS for the Amendment of Forest Plans, comments regarding Interim Directive #2 are moot. The FEIS no longer makes reference to Interim Directive #2, though you may still find the analysis for that directive in the Pocket/Baker project record.

The final Recovery Plan more clearly defined the pine-oak habitat and changed a number of guidelines. Those not included in the final Recovery Plan included limiting harvest to 20% of the pine-oak type; limiting the even-aged management prescriptions to 25% of all harvest types; and retaining all trees in the largest 25% diameters. The DEIS provided lengthy discussions on the reasons these guidelines could not be met in Alternatives 1 and 2.

2-21 1. The Pocket/Baker timber sale projects are not contemplated by the Coconino LRMP or any amendments. The LRMP must be amended to allow the project to go forward. Timber harvest, volume harvested, and acres harvested is one of the most controversial decisions laid out in a LRMP and LRMP EIS. In fact timber harvesting is one of the most controversial types of projects the FS pursues. The LRMP is a programmatic planning document that makes resource allocations. The LRMP must be amended to allow the project to go forward. The DEIS does not state whether the lands in question are even part of the suitable timber base for the Coconino?

2-22 2. The cumulative effects analysis is inadequate. What years were the Crook and Baker timber sales executed? The Baker sale does not appear in the Forest Plan, please explain? All past entries should be detailed, how many MBF removed, how many acres entered, how many acres of each MSO territory entered by each entry? Much of the area was logged so recently and so heavily that entering the area again so quickly may render long-term site productivity permanently impaired.

2-23 3. The preferred alternative does comply with the Draft Recovery Plan for the MSO. The FS recognizes numerous ways in which non-compliance exists. The FS has grossly overstated the need to treat huge numbers of acres to reduce mistletoe in this decade. The FS proposes to harvest almost 50% of the mistletoe acres. The FS refuses to comply with the Draft MSO Recovery Plan in violation of common sense, good faith planning efforts, NFMA, APA,ESA and FS policy. The FS refusal to comply is typical of the hostility the agency has shown for efforts to protect the owl. The alternative that meets and complies with the Draft MSO Recovery Plan should be chosen.

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2-24 4. The area should be surveyed for goshawks more extensively. The proposed action will remove many of the largest trees in stands this will be a set back for goshawk and MSO habitat in the short and mid term the FS needs to disclose this fact.

2-25 5. The issue of the need for replanting after harvest is not addressed in the DEIS.

2-26 6. The DEIS acknowledges briefly that dwarf mistletoe are highly important for many wildlife species but then basically refuses to convert this admission into any legitimate analysis. The positive aspects of dwarf mistletoe are not analyzed.

2-27 7. The DEIS notes that neotropical migratory birds live in the Pocket/Baker area, yet fails to make the connection, or fails to disclose the correlation that exists between dwarf mistletoe and bird species richness and the effects that the project many have on neotropical migratory birds.

**2-21** See response to comment **2-6.**

**2-22** The years in which timber sale activities occurred have been added to the FEIS. The Baker sale does not appear in the Forest Plan sale offering schedule because it was sold (1985) prior to the Forest Plan publication (1987). Volumes removed have also been added to the FEIS. Site productivity was discussed in the DEIS (pages 4-55 through 4-57) (pages 4-16, 4-17). See also the response to comment **2-9.**

**2-23** The total acres of stands infected by some level of mistletoe is approximately 19,675. Total acres treated in Alternative 2 is 6,781. This represents 34% of the total infected acres, not the 50% you stated. Alternative 6 treats less than the 34%. See also the response to comment **2-10.**

**2-24** The area was surveyed for goshawks according to protocol. Large trees are not being extensively removed -- only an estimated 300 out of 46,000+.

**2-25** There are no planting needs anticipated because none of the treatments are regeneration harvests described under NFMA requiring regeneration within 5 years after harvest.

**2-26** We are not aware of studies which explicitly relate "x" acres of mistletoe to a given level of birds. It is our assertion that nearly 13,000 acres (56% of Pocket/Baker) with dwarf mistletoe (after implementation of Alternative 2) is sufficient for the wildlife benefits described in the DEIS. Alternative 6 proposes to leave nearly 15,500 acres with dwarf mistletoe.

**2-27** The DEIS cites the Bennetts study which discloses the correlation between dwarf mistletoe and bird species richness. See also response to comment **2-26.**

2-28 8. The DEIS uses a definition of old-growth forest (found in the LRMP) that is not ecologically or scientifically valid. There are very blocks of old-growth forest 100 acres or larger. This arbitrary and un-ecologic definition basically disqualifies almost all forest areas from this designation

2-29 9. The DEIS states on page 4-25 that removing the forest overstory will negatively affect habitat for neotropical birds. More specific detail of these effects is needed.

2-30 10. The DEIS states on page 4-26 that the lack of large trees is problematic for MSO, Goshawk and neotropical migratory birds, yet the preferred alternative will harvest more of those large trees and further harm the habitat for those species.

2-31 11. The DEIS does not contain a discussion of the cost-benefit analysis for this project. The project will obviously be a deficit timber sale. Please disclose the amount of $ the US will lose on this project.

2-32 12. The DEIS does not adequately address the effects of livestock grazing and forest health or the issue of overstocking by small trees and continued livestock grazing. We hereby incorporate by reference the letter recently sent from the Southwest Center for Biological Diversity to Regional Forester Charles Cartwright regarding Livestock Grazing and Forest Health. We also hereby incorporate by reference all comments on the DEIS from Don Moniak, Arizona Game and Fish Dept. and US Fish and Wildlife Service.

2-33 14. On page 4-31 the DEIS states that meeting the Draft MSO Recovery Plan is "impossible", this is patently false. The fact is that the FS can meet the Recovery Plan but that it is attempting not to. This is part of a trail of evidence that shows that a pre-determined outcome has been being executed in this project.



**2-28** The LMP definition was used to determine effects of this project weighed against the Coconino National Forest standards and guidelines for old growth. In addition, all stands were designated with a vegetative structure label which indicated relative age of the stand (i.e. young, middle, mature, overmature, etc.). From this Vegetative Stand Structure (VSS) label, we were able to recognize stands smaller than 100 acres which had old growth characteristics.

**2-29** The DEIS states "a lack of an overstory", not "removing the overstory". This sentence has been changed to reference the lower abundance of large trees versus smaller trees.

**2-30** See response to comment **2-2**.

**2-31** Yes it does. See figure 4-17 in the DEIS.

**2-32** The effects of grazing and the effect on overstocking of small trees was disclosed on pages 3-25 and 3-26 of the DEIS. The letter to the Regional Forester you referenced concludes that the "potential for natural restoration via a decrease in tree density is possible with removal of cows." The reply by the Regional Forester is that each project analysis will address the small tree overstocking/continued grazing issue.

This issue has been expanded in the FEIS. Within the Pocket/Baker area, the overstocking condition was created nearly a century ago with very little increase in seedlings and saplings in the last several decades (only 4% of the Pocket/Baker area). The increasing density is associated with continued growth of existing small ponderosa pine established in the last 30-60 years. With the large amount of acreage in an open condition and with continued grazing by both cattle and elk, we would expect, but are not getting the establishment of large amounts of regeneration. Removal of cattle, which represent only a portion of the grazing impact, does nothing to significantly reduce the tree density problem where trees average around 13 inches in diameter (Pocket/Baker average).

Don Moniak did not comment to the DEIS. Comments to the DEIS from Arizona Game and Fish and Fish and Wildlife Service are addressed in subsequent responses.

**2-33** This was in reference to a guideline in the Draft Recovery Plan that is not in the Final Recovery Plan. Therefore, this comment is not considered further.

2-34 15. The proposed action or (PA) was changed drastically after scoping and before the DEIS was issues. The scoping phase of the project should be re-opened to deal with the comments on this PA in a manner conducive the changes of course if necessary.

2-35 16. The entire analysis is heavily skewed toward the preferred alternative. The No-Action alternative is analyzed with genuine credence or in any meaningful level. The range of alternatives is not adequate for the project. An alternative which fully meets the MSO Draft Recovery Plan should be developed.

2-36 17. The FS reliance on ID#2 for the MSO is illegal as ID#2 is outdated, scientifically invalid and not based on the best current information.



**2-34** We do not believe the proposed action has been changed "drastically". Without specific details, we cannot address this comment further. Comments to the proposed action were considered by the ID Team in refining the proposed action and in designing other alternatives. Our records indicate you did not respond to the proposed action. See Chapter 10 for the numerous opportunities that were available for public comments.

**2-35** Without specific details, we cannot address the comment regarding the No Action Alternative. Alternatives are developed in response to issues. You do not state which issues were overlooked. Alternative 3 fully meets the MSO Draft Recovery Plan.

**2-36** The Final MSO Recovery Plan and the FEIS for Forest Plan Amendments now dictate the guidance for effects to the Mexican spotted owl. Therefore, this comment is not considered further.

2-37 18. The fact that stock-tanks are to be constructed in a Wilderness area by this action is not given nearly enough analysis and discussion. The fact that part of the grazing allotment is inside the wilderness and is being re-authorized by this action is inadequately discussed. The fact the action will renew a ten year grazing permit is not discussed.

2-38 19. The Allotment Management Plan (AMP) needs to be revised and then NEPA done on those revisions not the other way around. The project violates NEPA, APA and FS policy.

2-39 20. In the Section on Plant Responses to Livestock Grazing on page 4-36 contains highly selective referencing and basically ignores the huge body of science regarding the negative effects of cattle grazing on plants.

2-40 21. The DEIS fails to incorporate the Regional Goshawk Guidelines and Scientific Committee Management recommendations regarding goshawks and livestock grazing.

2-41 22. Page 4-38: How many existing trees over 24" are there, over 18"?

2-42 23. Page 4-39 is further evidence of the bad faith skewed pre-determined analysis, it states that the Dispersal Habitat Rule requirements have been superseded by the Draft MSO Recovery Plan but in other places and in letters the FS states they are still under ID#2. The FS is employing highly selective adherence to the Draft Recovery Plan.

2-43 24. The DEIS fails to incorporate the total body of information the FS has regarding range condition in the area. FS is ignoring some of its own range reports.

Thank you for your consideration of our comments.

Sincerely,

Peter Galvin



**2-37** No stock tanks are to be construeted in the wilderness. The FEIS has been changed to refleet grazing in the wilderness and the fact that the preferred alternative will renew a ten year grazing permit.

**2-38** Your statement is incorrect.

The allotment management plan integrates the aetions needed to manage rangeland resources for livestock grazing and soil proteetion. It also integrates resource objectives, standards, guidelines, and management requirements for soil and water for watershed protection, wildlife and fisheries, reereation, timber, and other resources on lands within a range allotment. An allotment management plan is the primary document whieh guides implementation of forest plan direction for rangeland resourees.

An allotment management plan may be combined as practicable with other forest environmental analysis and forest plan implementation decisions to achieve integrated management of resources and to minimize paperwork (FSM 2212, WO Amend. 2200-91.4).

**2-39** This section has been expanded in the FEIS.

**2-40** Regional goshawk direction is applied to known territories. There are no goshawk territories within Pocket/Baker.

**2-41** Inventory data for trees over 18 inches DBH was done only for the Baker 10K and only where they occurred in groups of three or more. The data shows approximately 0.4 groups per acre with an average 5 trees per group. When expanded to the Pocket/Baker ecosystem, the figure indicates approximately 46,000 large trees present (exeludes 18 inch plus DBH as individuals. There is no information specifically for trees over 24 inches DBH.

**2-42** Since the Recovery Plan became final, this eomment is moot. Therefore, it is not considered further.

**2-43** Without reference to specifie range reports, we eannot address this eomment.

JUN 14 1995

#15

**PRECISION PINE & TIMBER, INC.**
P O. BOX 70
HEBER, ARIZONA 85928
(602) 536-2181

13 June 95

John Gerritsma,
Team Leader
Pocket-Baker

John,

3-1 I have perused the Draft E.I.S. for Pocket-Baker. I have no comments at this time.

Thank You for the opportunity to Comment.

Sincerely,

John R. Smith

P.O. DRAWER W WINSLOW, AZ 86047



**3-1** Thank you for your comments.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Arizona State Office
3707 N. 7th Street
P.O. Box 16563
Phoenix, Arizona 85011

IN REPLY REFER TO
1736 (932)

JUN 30 1995

Mr. Bruce Greco, District Ranger
U.S. Forest Service
Long Valley Ranger District
HC 31, Box 68
Happy Jack, AZ 85024

Dear Mr. Greco:

4-1 The Bureau of Land Management (BLM), Arizona State Office, has no comments regarding the Notice of Intent to prepare an Environmental Impact Statement for the Pocket/Backer Ecosystem Projects. The BLM does not have any lands adjacent to the proposed project site. Therefore, BLM will not be participating as a joint lead agency or as a cooperating agency to prepare the Environmental Impact Statement.

The BLM would like to receive a copy of the draft and final EIS. If you have any questions, please contact Gina Ramos at 602-650-0511.

Sincerely,

Herman L. Kast
Resource Planning, Use
and Protection



**4-1** Thank you for your comments.

W.A. and Peggy Randall

P.O Box 4

Pine, AZ 85544

July 12, 1995

U.S.D.A. Rarger Service

Bruce C. Greco Dist. Ranger

H C 31 Box 68

Happy Jack, AZ 86024

Dear Mr. Greco,

Thank you for this opportunity to respond to the Draft Environmental Impact Statement for the Pocket/Baker Ecosystem.

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We feel that Alternative 2 is the most acceptable alternative. We have written some of our opinions on a few of the subjects in the booklet.

Page 1-6

1. (Concerning Dwarf Mistletoe infestation)

5-1 It seems that by removing the heavily Dwarf Mistletoe infected trees it would reduce fire hazard, improve range condition, and allow the smaller trees to grow to a maximum size, therefore becoming suitable for nesting and roosting habitat for the Mexican Spotted Owl.

Page 2-5

2. (Concerning aspen management)

5-2 The planting of orchard grass after logging and fires is a great help to the young aspen because it is tall and continues to be very nutritious, even after frost, and therefor removes some of the pressure on the aspen, from the elk.

Page 2-5

5-1 Thank you for your comments.

5-2 Research cited in the DEIS indicates that fencing is the most practical method of protecting small aspen treatment areas as are proposed in Pocket/Baker.

3. ( Concerning prescribed fire, and wildland fire management)

Because fire is a desirable treatment, a much larger area should be burned than is shown in the Figure 2-1.

5-3 It is very important to seed burned areas with grasses such as orchard grass and wheat grass. These grassed produce a large amount of forage that stays plantable for a long time and will draw grazing animals into the area and reduce the pressure of elk on the meadows ect. It is very adaptable to this area, and will grow quite readily. These grasses are very beneficial to the turkey, which deserve consideration.

Page 2-8

4-C. (Concerning the closing or relocation of roads)

We are unhappy with the closing of so many little roads that are on the ridge tops. This is a great source of recreation for many families and a gook place for diversified campers.

5-4 We would like to see road 609 closed where it first reached the edge of the canyon past Earls tank No. 3641. We see no reason for this road to tie into the pocket point road. The number seems to be 9366 R, but it is not clear on my map.

5-4 We are for closing this road because there are turkey in this area of calf Pen Canyon and believe the amount of recreational use that would be in the area would be determinately to them.

Page 2-9

5. (Concerning grazing management)

We do not feel that it is reasonable to reduce livestock numbers or time allowed if the problem is elk. This summer before the cattle were taken to the Calf pen allotment, the

5-5 elk had used a lot of the forage. we feel the game department should be forced to reduce the size of the elk herds. They could do this by increasing the hunt permits and the length of the hunts, particularly on cow elk.



**5-3** As the map on page D-1 of the DEIS indicates, there are only a few sites not proposed for broadcast burning. Poor soil conditions, low percent ground cover, past fuel treatments, and Threatened and Endangered species considerations are just some of the reasons for not burning the entire Pocket/Baker ecosystem. Grass seeding will occur only where watershed conditions after burning indicate a need for soil stabilization. Only native species will be used. Orchard grass is a nonnative species.

**5-4** Roads are closed where they are causing erosion or where they are threatening the critical habitat of Threatened or Endangered species. The reduced road density will also reduce potential harassment of wildlife. Road 609 was rerouted to correct severe impacts caused by being located in a stream course while preserving the current access to both highways 87 and 260. Many hours were spent with both public interests and members of the Interdisciplinary Team to agree to a set of road closures that considered water quality, fire control access, recreation, wildlife, resource access (timber, range improvements, special use sites) and aesthetics. The section of road 609 that you address has significant use for recreationists and for fire access (the 1992 Mile Fire was partly accessed from this road).

**5-5** The Game and Fish Department is aware of the size of the elk herd and has increased the number of permits over the past few years. Management of elk numbers is beyond the scope of this FEIS.

Page 2-9

Table 2-1 ( Concerning range improvement items)

5-6 We feel that 5 new tanks is a minimum. the more water there is available, the more habitat will spread, which is beneficial to all things.

Page 3-13

3.7 (Concerning mountain meadows)

5-7 With the new grazing systems cattle would not damage the meadows and should be allowed to use them.

I hope that you will consider our thoughts and opinions on these matters.

Thank you.

W.A. and Peggy Randall

**5-6** Stock tanks may or may not benefit wildlife depending on their location. An increase of one species may be detrimental to another; therefore, we disagree that stock tanks are a benefit to all things.

**5-7** Meadows can be utilized by livestock when meadow condition and grazing practices are able to sustain the function of the meadow. The exclosures to livestock grazing and recreation traffic for the meadows stated on page 3-13 were done to allow the meadows to recover. At such time that recovery has taken place, livestock utilization can be reevaluated.

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

July 14, 1995 Fife Symington, Governor Edward Z. Fox, Director

Mr. Bruce Greco
Long Valley Ranger District
Coconino National Forest
HC 31 Box 68
Happy Jack, Arizona 86024

Re: Draft Environmental Impact Statement for the Pocket/Baker Ecosystem.

Dear Bruce:

The Department appreciates the opportunity to submit the following comments on the Draft Environmental Impact Statement for the Pocket/Baker Ecosystem:

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6-1

1. The Department commends the Long Valley Ranger District for holding a meeting early in the scoping/planning process which involved Off Highway Vehicle (OHV) user groups and increased the awareness of potential recreation (i.e., OHV and road) impacts to the East Clear Creek watershed (e.g., Potato Lake area). Since Forest Service resources available to monitor and gain compliance of public related Best Management Practices (BMP's) are limited, voluntary compliance is a vital element to water quality protection. Voluntary compliance can be accomplished through public education efforts and positive public contacts which explain the importance of complying with Federal and State water quality standards and how such protection is achieved. There are opportunities at the Cinch Hook snowplay area, recreational sites located on meadows, and the 608 road to provide interpretive educational information (i.e., positive signs, pamphlets, and/or public contacts).

6-2

2. Snowplay is well established at the Cinch Hook area attracting over 200 visitors per weekend and there has been a steady increase since the early 1980's. Illegal parking along the shoulders of highways 87 and 260 occur due to the lack of adequate parking for the Cinch Hook snowplay area. Provide adequate parking at the Cinch Hook snowplay area. Minimize erosion and sedimentation through effective planning prior to the initiation of construction activities and through effective contract administration during construction. Water quality impacts can be reduced by effectively planning for erosion control. Erosion control practices include the re-establishment of vegetation, providing physical protection to exposed soil, preventing the downslope movement of soil, and implementing drainage controls. Some examples of erosion control methods that could be applied at a site for keeping the soil in place would be applying grass seed, jute mesh, tackifiers, hydromulch, paving, or rocking of roads,

3033 North Central Avenue, Phoenix, Arizona 85012, (602)207-2300

**6-1** If an opportunity presents itself, we like to provide for interpretive information. One such tool is the carsonite signs used to inform the public of road closures, indicating roads are closed for water quality and/or wildlife habitat purposes.

**6-2** The Forest Service has a memorandum of understanding with the State of Arizona in which the Forest Service utilizes Best Management Practices to maintain and enhance water quality. We have included in the FEIS a section that summarizes standard operating procedures. This section includes the use of Best Management Practices (see Chapter 2 in the FEIS). All construction activities utilize BMP's. However, the implementation of a parking area for Cinch Hook snowplay area is beyond the scope of this FEIS. These comments will be retained for future use.

6-2 waterbars, culverts, or retaining walls. Potential negative effects to the balance of the natural drainage pattern should be mitigated; sediment basins and sediment filters should be established to filter surface runoff where such runoff may enter a stream. Construction activities should be scheduled to avoid periods of precipitation and runoff. Management options such as seasonal closures should be considered if future impacts to the soil condition or water quality occur as a result of increased recreational use at the Cinch Hook area.

6-3 3. Page 2-6 (D) Broadcast Burning and Page 2-7 (E) Treatment of Activity Slash of the Draft EIS for the Pocket/Baker Ecosystem do not indicate the type(s) of slash streatment(s) to be implemented on the sites where forest fuel litter exceeds 15 tons per acre (approximately 4300 acres). Please indicate if the lop-scatter slash treatment will be the chosen treatment on the acreage previously mentioned.

6-4 4. West Clear Creek has been proposed for classification as a unique water. R18-11-107 Antidegradation subsection D states that existing water quality shall be maintained and protected in a navigable water that is classified as a unique water or that the Director has proposed for classification as a unique water pursuant to A.A.C. R18-11-112. The Director shall not allow limited degradation of a unique water pursuant to subsection (C) of this Section. Please find enclosed a copy of CHAPTER 11. WATER QUALITY BOUNDARIES AND STANDARDS.

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6-5 The Department sincerely hopes these comments prove to be useful and I look forward to participating with the Long Valley Ranger District in the development of Best Management Practices and monitoring in the future. If you have any questions or if I can be of further assistance please don't hesitate to call me at (602) 207-4519.

Sincerely,

Peter Jagow
Forestry Activities Specialist
Nonpoint Source Unit

enclosure

PJ:mfc

cc: Al Roesler, Ombudsman and Outreach Officer, ADEQ
Chic Spann, Regional Hydrologist, USFS Southwest Regional Office
John Gerritsma, Team Leader, Long Valley Ranger District

**6-3** We have more clearly stated that fuel treatments will be lop and scatter and/or broadcast burning. We have also clarified that machine piling will occur on landings, particularly if whole-tree skidding occurs and possibly along some portions of the highway right-of way.

**6-4** On September 8, 1995, the Arizona Department of Environmental Quality removed from further consideration West Clear Creek as a Unique Waterway.

**6-5** We welcome the participation of the Arizona Department of Environmental Quality in preparing and managing monitoring sites for water quality.

ARIZONA STATE PARKS

1300 W. WASHINGTON
PHOENIX, ARIZONA 85007
TELEPHONE 602-542-4174

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DEPUTY DIRECTOR

July 15, 1995

Mr. Bruce Greco, District Ranger
USDA Forest Service
Long Valley Ranger District
HC 31 Box 68
Happy Jack, Arizona 86024

Re: Draft EIS for the Pocket/Baker Ecosystem

Dear Mr. Greco:

The following are the comments of the Arizona State Parks Off-Highway Vehicle (OHV) Recreation Program regarding the Draft EIS for the Pocket/Baker Ecosystem. This organization includes the nine-member governor appointed advisory group representing diverse OHV interests, the general public and conservation organizations in Arizona. By state statute, this group is geographically diverse and representative of numerous constituencies. Wherever the term "we" appears in this letter, it refers to the aforementioned persons. Please make these comments part of the public record in the final EIS decision.

State Parks OHV Program and State Historic Preservation Office (SHPO) staff have taken an active role in the development of the draft decision. This participation included attendance of a field trip to examine the 608 road, submission of suggestions and expertise on how to deal with the cultural resources and recreation opportunity offered by this road. Additionally the SHPO has obtained historical information on the construction and use of the road. The Arizona State Association of 4x4 Clubs has also taken an active role. The State OHV Coordinator has met with the Historic Trails Subcommittee of the Arizona State Committee on Trails (ASCOT) to discuss the 608 road.

These comments will generally the format provided in the draft EIS:

We support items 1-7 that are common to all the action alternatives. On item 7 please note the following:

The OHV and Preservation communities are in agreement that the historic drainage structures on the 608 road should be preserved. A no action decision on the road is not acceptable because the historic structures would continue to deteriorate and the road would likely remain closed. Therefore we are wholly supportive of the desired future condition stated on page 8-9 (Appendix B), with the





**7-1** Your support of Alternative 2 has been noted. The term OHV users has been changed to users as you suggested. The Forest Service also hopes that a successful partnership will evolve to expeditiously resolve the problems on road 608.



**7-1**

exception of the term "OHV users". We feel the the statement should read "The 608 road is open to *all users* (rather than OHV users) because erosion has been stabilized and the cultural structures restored through partnerships with user groups." We feel this statement is all inclusive and does not imply exclusive use by any one group; opportunities such as the 608 road are likely to appeal to a diverse cross-section of people. Some people may access this road with vehicles while others hike, ride bicycles or horses. We also believe that it is imperative to correct the resource concerns as soon as possible in order to prevent any further degradation to the road from the effects of time and unauthorized traffic.

We also support the preferred alternative (2) as proposed in the draft.

We commend your efforts on well written and researched document. We especially applaud your emphasis on the human dimension of ecosystems management (page 1-3). People do depend on the ecosystem for their well-being and survival. We believe recreation to be a source of human well-being, and that multiple use recreation can be accommodated without compromising ecosystems. We also applaud your sincere interest in seeking win-win solutions among diverse interests that the stated desired future condition of the 608 road represents. We look forward to working with you in partnership efforts such as the restoration of this historical road.

Sincerely,

Terry Heslin,
OHV Program Coordinator

FOREST CONSERVATION COUNCIL
*Southwest Regional Office*

July 17, 1995

Mr. John Gerritsma
Long Valley Ranger District
HC31 Box 68
Happy Jack, AZ 86024

Dear Mr. Gerritsma,
These are FCC's comments on the draft EIS for the Pocket/ Baker Ecosystem analysis.

8-1 Most of the proposed harvest treatments for the preferred alternative occur in MSO critical habitat ( 2947 mbf out of 2991 mbf, DEIS at p.E-7) There is no conclusive research that has been done to determine the effects of timber harvest on MSO habitat, so we feel that all proposed activities within critical habitat be dropped from the project. Along those lines, your decision to not

8-2 maintain the 50-9-40 rule for dispersal habitat for alternative 2 is unacceptable. To cite a past lawsuit as rational for such a decision is irresponsible. Dispersal corridors should be maintained for the owl, as they are an essential element of owl habitat and allow for connectivity between

8-3 core areas. Also, the decision to cut twice the harvest level recommended by the recovery guidelines (Figure 4-16) shows that this project will undoubtedly harm habitat for the owl.

8-4 In regard to dwarf mistletoe infestation in the area, you imply that the levels of dwarf mistletoe are exceedingly high yet provide no quantitaive information regarding the level of infestation on a forest basis. How does this analysis area fit within the larger matrix of the forest as a whole, and is the present level within the normal range of infestation over time?

8-5 On page 2-13, in the paragraph related to old growth, you mention that stands with 50% or more of old ponderosa pine are deferred from treatment. What about stands with a significant large tree component which fall below the minimum 50% level? How many trees over 18" dbh are being cut? FCC opposes any harvest of large trees alone or within clumps in stands dominated by younger trees, as large trees are a critical and rare component to the forest as a whole.

Sincerely,
Dick Cameron
Dick Cameron

P.O. Box 22488
(505) 986-8435
Santa Fe, New Mexico 87502-2488
(505) 820-0079 (fax)
E-mail fccsw@igc.apc.org



**8-1** The effects of timber harvest within critical habitat for the Mexican spotted owl is guided by the recommendations within the Final Recovery Plan and the FEIS for Forest Plan Amendments. As required by the Endangered Species Act (Section 7), consultation on proposed projects within the critical habitat have been completed. Therefore, the effects of timber harvest activities are based on the latest and most recent compilation of scientific studies (incorporated into the Final MSO Recovery Plan).

**8-2** The dispersal habitat rule is no longer valid. Therefore, this comment is not considered further.

**8-3** Harvest levels are evaluated against the MSO Recovery Plan.

**8-4** Forest level infestation was disclosed on page 3-32.

**8-5** Inventory data for trees over 18 inches DBH was done only for the Baker 10K and only where they occurred in groups of three or more. The data shows approximately 0.4 groups per acre with an average 5 trees per group. When expanded to the Pocket/Baker ecosystem, the figure indicates approximately 46,000 large trees present (excludes 18 inch plus DBH as individuals, so the actual total is higher than the estimated 46,000). Trees over 24 inches DBH were not inventoried separately.

The removal of large trees (between 18 and 24 inches DBH) is slated only where regeneration is threatened with infection from dwarf mistletoe, or trees which pose a safety hazard along highways 87 and 260. The criteria for removal has been illustrated (added to appendix in FEIS). Trees larger than 24 inches that are not a safety hazard along the highways will not be cut. An estimated 300 trees 18-24 inches DBH scattered throughout approximately 5,200 acres will be cut. It is estimated that 1/3 to 1/2 of the estimated trees to be cut are hazard trees along highways 87 and 260. The rest of the trees are within overstory removal units or seed cuts scattered mostly through the Baker portion of the analysis area.

The harvest of 300 trees, many of which are hazard trees along major highways, represents at most 0.6% of the total. We do not feel that this is significant.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
ARIZONA ECOLOGICAL SERVICES STATE OFFICE
2321 W. Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951

Telephone: (602) 640-2720 FAX: (602) 640-2730

July 24, 1995

In Reply Refer To:
AESO/SE

Mr. Bruce C. Greco
District Ranger
Long Valley Ranger District
HC 31 Box 68
Happy Jack, Arizona 86024

Dear Mr. Greco:

The Fish and Wildlife Service (Service) provides the following comments to the Draft Environmental Impact Statement (DEIS) for the Pocket/Baker Ecosystem Management Project, Coconino National Forest, Long Valley Ranger District.

General Comments

These comments on the DEIS are similar to those presented by the Service through the interdisciplinary team process on May 10, 1995. The Service believes that the DEIS places too little emphasis on the short-term effects of the alternatives, and does not clearly state the negative aspects of alternatives 1 and 2, particularly to the Mexican spotted owl (Strix occidentalis lucida) (MSO). The document continues to use many unsupported terms of judgement and appears as if it is written to support alternative 2. Although it presents many complex issues and subjects well, this document should more clearly differentiate between facts and opinions.

Specific Comments

Chapter 1

Issue 1, page 1-6, first ¶

9-1 The forth and fifth sentences are misleading to a certain degree. These imply that with or without treatment, the area can become MSO nest/roost habitat. In fact, only a small portion of the 20K area has the potential to become nest/roost habitat due to the vegetative type and growing conditions. This is contradictory to the previous sentence which states that most of the habitat

JUL 26 1995

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9-1 All alternatives have been evaluated against the final MSO Recovery Plan. The amount of potential nest/roost habitat has been displayed in the FEIS (see Chapter 3).

is functioning as foraging and dispersal habitat. Providing an estimate of how many acres have the potential to become nest/roost habitat would be helpful.

Issue 1, page 1-6, second ¶

9-2 If most of the area is functioning as foraging and dispersal habitat, then an explanation of the effect of loss of canopy closure on this type of habitat is needed. This paragraph implies that it will have a negative effect, although the vast majority of the area is not capable of becoming nest/roost habitat.

Issue 1, page 1-6, third ¶

9-3 The real issue is not whether the short-term impacts are more acceptable than the long-term impacts, and vise versa, but what the different effects are and what are their consequences. There are positive and negative effects of each. This paragraph concentrates on the negative effects of not implementing alternative 1 or 2, but does not mention the positive effects, namely that not implementing these alternatives will be in compliance with the short-term recommendations of the MSO Draft Recovery Plan.

Issue 1, page 1-7, first ¶

9-4 The word "creating" in the first sentence should be changed. It is not accurate. It is better to say that the habitat will be moved toward nest/roost habitat if it has the potential. In addition, the word "suitable" in the first sentence should be changed to "nest/roost" habitat.

Issue 1, page 1-7, second ¶

9-5 In the first sentence, the reference to "proposed" MSO critical habitat should be changed to "final". In the same sentence, the word "guidelines" should be changed to "recommendations". In addition, it would be good to mention here that an adverse effect may result if the actions are not in compliance with the draft or the "final" Recovery Plan (due in October 1995). In the second sentence, add that adverse effects may occur "in the future." The last sentence does not appear relevant to the issue. What will the desired vegetative structures be in the future, and how do we known that now?

Issue 1, page 1-7, Desired Condition

9-6 Suggest editing the first sentence to read "Habitat conditions lead to meeting or exceeding the delisting criteria of the Draft MSO Recovery Plan (USDI 1995 pages xx-xxi)."

Issue 1, page 1-7, Resource Objectives

This issue directly relates to MSO as well as to dwarf mistletoe, yet there is no mention of MSO as a resource objective. If one of the desired conditions mentioned above is to delist the MSO



**9-2** This paragraph has been rewritten. Evaluation of the effects on potential habitat was based on guidelines in the final MSO Recovery Plan (see Chapter 8, FEIS).

**9-3** The positive and negative effects of this issue were disclosed in the DEIS in Chapter 4. Compliance regarding the Draft Recovery Plan are moot as the guideline that did not allow Alternatives 1 and 2 to meet the Plan do not appear in the Final MSO Recovery Plan.

**9-4** Your point has been noted and reflected in the FEIS.

**9-5** Your points are noted and reflected in the FEIS.

**9-6** Your edits are noted and reflected in the FEIS. Subsequent edits are also noted but not identified as a separate response item.

9-7 through maintaining a stable or increasing population after 10 years of monitoring, then a resource objective to meet this desired condition is imperative. In addition, there is no mention in this section about whether these objectives are short-term or long-term. Limiting growth and mortality loss can be a long-term goal as well. As the Service suggested previously, an objective should be to delist the MSO through implementation of the Draft and Final Recovery Plans.

This issue is still only partially addressed. More attention needs to be given to the conflict between optimum long-term mistletoe treatment and the short-term recommendations of the Draft Recovery Plan. This is never clearly stated, i.e. that "optimum" treatment is in direct conflict with the short-term recommendations of the Plan. The goal of the Plan's recommendations is to recover the species. This cannot be done unless the recommendations are followed.

Chapter 2

2.2, page 2-2, first ¶

For perspective, it would be helpful to include the dates of the Interim Directives. The fifth sentence regarding the halting of timber sales is not relevant to the project.

2.2, page 2-2, second ¶

The work "limitation" in the second sentence regarding dispersal habitat levels for MSO should be changed to read "recommendations for MSO dispersal habitat levels."

2.2, page 2-2, third ¶

The term "ecosystem principles" needs to be defined. Given that there is little agreement on the definition of the term "ecosystem management," the Forest Service's "principles" need explaining here or in an appendix.

2.2, page 2-2, fourth ¶

9-8 The first sentence is incorrect: delete "When the MSO became listed as a threatened species". Suggested wording is "The Fish and Wildlife Service proposed critical habitat for the MSO on December 7, 1994, and provided the Forest Service with draft guidelines for determinations of effect based on the Draft MSO Recovery Plan for actions within critical habitat." The Second sentence should be edited to read "Because neither alternatives 1 or 2 met the recommendations of the Draft Recovery Plan, alternative 3 was developed. The goal of this alternative is to not adversely effect critical habitat." The last sentence of this paragraph is confusing and we suggest rewording. Basically it is saying that alternative 3 has merit because it is within the guidelines of the Recovery Plan.



**9-7** The issues of lack of vegetative seral stages and diversity (renumbered to #1 in the FEIS) and the maintenance and sustainability of old growth and dense habitat (DEIS #1 refocused and renumbered as #3 in the FEIS) consider the effects of dwarf mistletoe and vegetative stand structures for the MSO.

**9-8** Your points were noted in an entire rewrite of this section.

2.22, page 2-7, D.5

9-9 The words "management territory" should be changed to "PAC" (protected activity center). The new terminology of the Recovery Plan should be used. Burning in a PAC during the breeding season may be an adverse effect and result in incidental take of the species.

2.33, page 2-8, 4.B.

9-10 The Service suggests that some if not all of these "hazard" trees be left on the ground in areas deficient in down woody material, particularly in MSO critical habitat. We understand that fire starts may be a concern, so trees could be felled and left at some distance from the road (for instance 100-200 feet).

2.34 Alternative 1, page 2-12, Specific feature 2, first ¶

9-11 In the last sentence, define the "mandated direction;" is it Interim Directive 2? Reference to "Dispersal Habitat" implies the Dispersal Habitat Rule (DHR), which was never a mandated direction, but a conservation recommendation and a reasonable and prudent measure for specific Forest Service projects in Service biological opinions. This is stated correctly on page 2-25 under discussion of the intent of alternative 2. "Dispersal Habitat" should not be capitalized, as it is not elsewhere in the document, and because of above reasons.

2.34 Alternative 1, Page 2-13, Moderate and High Mistletoe Infection

Again, this paragraph implies that dispersal habitat is a "requirement." The correct application of this concept should be expressed as indicated above. In addition, if this paragraph is attempting to define the DHR, it has left out discussion of average diameter at breast height (DBH).

2.35 Alterative 2, page 2-15, Specific feature 2, first ¶

"DHR" should not be used. The document uses "dispersal habitat" elsewhere in the document and this consistency should be maintained.

2.36 Alternative 3, page 2-16, Intent

9-12 The Draft Recovery Plan is not a requirement, but a set of recommendations to lead to recovery of the species. The Plan may become a "requirement" if the Forest Service adopts it as a Forest Plan amendment. If the Forest Service anticipates adoption of the Plan into their Forest Plans, then state that this alternative meets Forest Plan direction. Critical habitat is no longer "proposed" but is final.



**9-9** All references to management territories have been changed to reflect our evaluation to the final Recovery Plan and its terminology.

**9-10** Hazardous snags felled in a similar project along Forest Highway 3 were felled and retained. However, some of the more solid snags were eventually cut and removed by firewood gatherers. We expect similar results along Highways 87 and 260.

**9-11** Comments regarding the dispersal habitat rule are moot since the final MSO Recovery Plan guides dispersal and foraging habitat in a different manner. All alternatives were evaluated against the final recovery plan.

**9-12** This paragraph has been rewritten to reflect your comments. References to the final MSO Recovery Plan replace comments to the draft.

Chapter 3

3.6 Patches, page 3-9, first ¶

Habitat used for foraging exclusively is termed foraging habitat. MSO may forage in all habitat types depending on the condition and location of that habitat.

3.6 Patches, page 3-9, second ¶

9-13 As stated previously, the second sentence regarding the halting of timber sales is not relevant to the project. It is past history and appears merely as a complaint. A consistent definition of dispersal habitat as recommended in past biological opinions needs to be presented. Refer to it once in detail. There is more information in this paragraph than has shown up in previous discussions of the same subject. The dispersal habitat "criteria" was a recommendation that the Forest Service chose to incorporate into project planning in most cases.

3.6 Patches, page 3-10, first ¶

Protected areas also include areas that meet "threshold conditions" as defined in the Draft Recovery Plan. Change "os" to "is" in the second sentence.

3.6 Patches, page 3-11, first ¶

9-14 The first sentence is only partially accurate. Although the Service did propose critical habitat prior to completion of the Draft Recovery Plan, it is a separate process and due to the time constraints of the law, does not usually coincide with a Recovery Plan. The final rule to list the MSO as threatened (March 16, 1993) identified that designation of critical habitat was prudent. In this rule, the Service stated that critical habitat was not determinable at that time without additional study. The Service set the date for final critical habitat publication for November 4, 1993. This paragraph should state that the final critical habitat rule was published on June 6, 1995. The last sentence is incorrect. It should state that a "may affect, likely to adversely effect" determination should be made for any action that does not comply with the Draft Recovery Plan. A "may affect" determination may be appropriate for many actions in critical habitat that comply with the guidelines of the Draft Recovery Plan.

Chapter 4

4.1 Summary of landscape Interactions, page 4-1

9 15 It should be stated as a "flow/disturbance element" that treatment will reduce dense canopy immediately. This chart concentrates almost exclusively on the long-term effects. The short-term effects of both treatment and non-treatment should be displayed.



**9-13** See response to comment 9-11.

**9-14** This entire paragraph has been rewritten to reflect your points.

**9-15** The scheme of displaying the interrelationships between elements and flows of the landscape was apparently confusing to many readers. Therefore, your comments were incorporated in the revision of the effects section (see Chapter 8, FEIS).

4.11, page 4-2, third ¶

9-16 What is the reference for the last sentence referring to typical Q-factors?

4.16, page 4-6, second ¶

9-17 The word "management" should be placed after the word "uneven age" in the first sentence. With regards to the same sentence, the DEIS states on page 3-11 that only 6.6 percent (%) of this "ecosystem" is protected habitat. The Service understands this to mean that this is the amount of habitat that may actually be used for nesting/roosting habitat at this time. How much of this protected habitat is moderately infected with mistletoe? What is the real effect of not treating this habitat?

4.16, page 4-7, first ¶

The word "potential" should be inserted before "nesting/roosting" in the first sentence.

4.18, page 4-9, first ¶

The next to last sentence in this paragraph mentions infection rating numbers of 5 and 6. Some explanation of what these numbers mean is warranted, here or in an appendix.

4.18, page 4-9, fifth ¶

"Then" in the last sentence should be changed to "than".

4.18, page 4-10, last ¶

9-18 The Service does not agree with the first sentence. Alternative 2, for example, proposes 269 acres of overstory removal, and over 500 acres more group shelterwood seedcuts than alternative 3. There would appear to be significant differences in canopy structure between these two alternatives. The table presented on page 4-51 indicates that the projections in 20 years for canopy structure between alternatives are similar, but the determination in this paragraph that short-term differences in the effects to canopy are "insignificant" are not justifiable. The next to last sentence in this paragraph jumps to a conclusion that is probably not defensible given the relatively small size of this project area within the range of the MSO. Therefore, the word "significant" should be removed, as should the words "will likely". Change the wording to "This situation may have future impacts on MSO habitat in the Pocket/Baker Ecosystem." The future of the MSO population depends on many parameters.

4.18, page 4-11, Dense Canopy

What is the definition of "dense canopy?"



**9-16** The reference came from the draft Recovery Plan. The same reference appears in the final MSO Recovery Plan (Volume II, Chapter 4, page 11).

**9-17** These comments are reflected in a revised environmental effects section (see Chapter 8, FEIS).

**9-18** Differences in canopy structures as they relate to the Mexican spotted owl and other wildlife are measured in terms of general density classes: "A" canopy being less than 40% canopy closure, "B" canopy between 40 and 60% closure, and "C" canopy being greater than 60%. By design, seedcuts have a low residual stocking to allow for regeneration to occur. Most of the seedcuts were proposed for stands with an "A" canopy (and none in "C" canopies). The function of an "A" canopy is relatively the same whether the canopy is at 15% (as in a seedcut) or at 30% (as in an open stand). Though there is a difference between 15% and 30%, the end result is still an "A" canopy and the associated function is relatively the same. Therefore, the mere number of acres of seedcutting does not by itself reflect whether or not a significant difference in structure occurs.

The essence of your point regarding the next to last sentence has been noted since this section was entirely rewritten.

4.18, page 4-11, second ¶

9-19 The information in the first sentence is very appropriate to mention. The Service believes that this point should be elaborated upon in the document. The second sentence mentions 13% of the sites are pine/oak sites. The Service believes this is a range-wide figure, and not specific to the Pocket/Baker Ecosystem or even the Coconino National Forest. To be complete on this point, a figure should be given indicating the percentage of MSO nesting in the pine/oak habitat type on the Coconino National Forest, of which there is a much higher percentage than the range-wide number indicates.

4.18, Alternatives 1, 2, 3, page 4-11, second and third ¶

9-20 The second paragraph does not mention the short-term effects of the shelterwood cuts and the overstory removal prescriptions proposed in alternatives 1 and 2. It continues to appear that this document is giving only half the story in terms of effects. The third paragraph would appear to fit better into the no action section just above.

4.34, page 4-29, title and second and third ¶

9-21 The word "conflict" in the title should be deleted. The second paragraph should discuss the differences between alternatives and short and long-term objectives with regards to the MSO Recovery Plan. It now discusses "conflicts." There are no "conflicts," there are only different objectives and outcomes. The Service does not make determinations of effect, and thus will not determine "adverse effect." Determination of effect is the responsibility of the action agency. The Service cannot concur with a determination of "not likely to adversely effect" MSO critical habitat if the action is not consistent with the Draft Recovery Plan or the final Recovery Plan. It should be clarified in this paragraph that this discussion involves actions in designated MSO critical habitat. The last sentence implies that the preferred alternative has already been selected due to the use of the word "conflict," and the words "there can be no other finding but adverse effect." This is not true in that the Service understands that alternative 3 is consistent with the Recovery Plan recommendations, and thus, an adverse effect would not be found for this alternative, nor for the "no action" alternative.

4.34, page 4-29, last ¶

9-22 The last sentence states the projected long-term effect of dwarf mistletoe. The short-term effects of mistletoe infections for the MSO could actually be considered beneficial because mistletoe creates 'witches brooms' for nesting. In addition, an increase in dead and down trees due to mistletoe caused mortality is likely to enhance prey populations for the MSO. The entire situation needs to be explained.



**9-19** You are correct that this is a misleading statement since the distribution of nest/roost sites on the Coconino is a far higher ratio towards pine-oak than the average across the owl's range. This is obviously due to the limited amount of mixed conifer habitat. These numbers have been revised to better reflect the condition more specific to Pocket/Baker.

**9-20** The effects of shelterwood cuts and overstory removals are included in the overall effects to canopies displayed in the graphs on page 4-13 of the DEIS.

**9-21** This section has been deleted from the FEIS since the draft Recovery Plan has been replaced by the final. The section that discloses the effects upon the MSO (see Chapter 8, FEIS) has been rewritten.

**9-22** See also the response to comment 2-26. The short term benefit of dwarf mistletoe is not quantifiable since there is no data that shows the level of dwarf mistletoe infection or the acreage at which either negative or positive benefits occur to the MSO. The Bennetts study cited in the DEIS already acknowledges the positive benefits of dwarf mistletoe on bird populations.

4.34, page 4-30, first ¶

9-23 The first sentence does not accurately portray what the Recovery Plan states. Suggest rewording to say "...MSO population is adequate due to no undisputable evidence of population decline now, or compared to known historical levels." The Recovery Plan states that this is an assumption based on present knowledge, but goes on to say that adequate studies have not been conducted to determine if this assumption is correct. The short-term strategy of the Recovery Plan includes recommendations that should be implemented until the species is delisted. After delisting, the long-term guidelines are to be implemented.

4.34, page 4-30, second ¶

The page reference in the last sentence is incorrect. The correct pages are 438-439. The Service suggests adding the following sentence after this paragraph: "The Service recommends that the guidelines of the Recovery Plan are applied to designated critical habitat to avoid adverse effects."

4.34, page 4-30, third ¶

Change this sentence to read "One of the guidelines of the Draft Recovery Plan that will assist in avoiding adverse effects to critical habitat is the use of uneven-aged prescriptions on 75% of the harvest acres in restricted habitat." Some discussion of the term "restricted habitat" as defined in the Recovery Plan will be appropriate here.

4.34, page 4-30, fifth ¶

9-24 The last sentence implies that if a stand does not have a perfect Q distribution of size classes it will not meet the intent of the Recovery Plan guidelines. This is not true. If a stand does not currently have the desired quantities of large trees, then treatment should move the stand toward this condition. A stand may be lacking in certain VSS classes but still have an uneven-age structure. The conclusions of this paragraph appear to be incorrect.

4.34, page 4-31, first full ¶

An explanation should be included from the Recovery Plan as to why the 20% limitation of harvest area is recommended. The statement that this limitation makes mistletoe treatment "impossible" needs to be deleted or qualified. It may make what may be "optimum" treatment difficult, but it does not prevent mistletoe treatment. This guideline does not "negate" efforts to control mistletoe. These statements appear biased.

4.34, page 4-31, second ¶

There are no "critical habitat guidelines," there are only Draft Recovery Plan guidelines. The wording of the first sentence should be changed to reflect this. In addition, this paragraph should

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**9-23** We were attempting to illustrate the plan's emphasis not only on current habitat, but also on the future. In lieu of attempting to paraphrase the MSO Recovery Plan now that the document is more widely available, this paragraph has been dropped.

**9-24** These guidelines were dropped in the final MSO Recovery Plan; therefore they are considered no further.

state that maintaining 25% of the largest basal area in a stand based on the Recovery Plan guidelines is made difficult in Pocket/Baker due to the lack of existing large trees. The difficulty with easily meeting this guideline is the existing condition of Pocket/Baker.

4.34, page 4-34, first and second ¶

The source of the first sentence is page 396 of the Recovery Plan. The first and second sentences of this paragraph are not related. Suggest placing the following sentence from the Recovery Plan between them: "In addition, MSO habitat can be ephemeral as net processes exert their influences, and as one site becomes MSO habitat, another may no longer be suitable." In the second paragraph, the word "problem" is judgmental and should be replaced with "can be effective". The third sentence should be qualified by mentioning that the "desired" levels are based on the Recovery Plan.

4.35, page 4-34, third ¶

The references should include "USDI 1995" for consistency.

4.35, page 4-35, first partial ¶

9-25 It should be noted that the Recovery Plan does not specify any limits on percent of slope needed to be considered nest/roost habitat. This should include the figure of habitat capable of becoming nest/roost habitat regardless of slope.

4.38, page 4-38 and 4-39

9-26 The short-term impacts (0-19 years) are again, not discussed. This must be included.

4.38, page 4-41, alternatives 1, 2

9-27 Delete discussion of the 1/2 mile buffer in the second paragraph. These were part of the draft recommendations for critical habitat, and are not part of the final.

The fifth paragraph's first sentence should be reworded to clearly state the facts: " The guideline of limiting harvest levels is exceeded on 15-17% of the harvest acreage in alternatives 1 and 2." In this same paragraph, the use of the figures in the second sentence could be considered misleading because they are based on your assumption that a minimum slope is needed for habitat to be considered potential nest/roost habitat. The "worse case scenario" should be stated as well, i.e. based on habitat conditions, not slope. The first sentence in the last paragraph should be reworded to state "Indications from limited survey routes..." We believe additional, intensive studies would be needed to verify the statements made in this paragraph.



**9-25** The notation regarding the Recovery Plan has been made in the FEIS.

**9-26** The short term impacts have been addressed in the FEIS.

**9-27** This section has been rewritten to reflect the guidelines of the final MSO Recovery Plan. Limited harvest levels is no longer a quantified criteria.

4.38, page 4-42

The sentence in the first partial paragraph is incorrect. One must have sufficient data to show a "trend." The second paragraph should be qualified to show that MSO do move around, and thus, some areas of apparently suitable nest/roost habitat may not be occupied for many years in a row. The Recovery Plan discusses managing for habitat regardless of current occupation.

9-28 The second paragraph also suddenly mentions the 20 basal area for oak figure. The public will not know where this came from, and in addition, this figure does not indicate the "desired level" of oak for nest/roost habitat. Although mentioned in the Recovery Plan's threshold conditions table, it is recognized that this is the "best of the best" and many areas occupied by MSO have far less than 20 basal area of oak.

This entire section makes no mention of the effects to MSO, such as the fact that the guidelines of the Recovery Plan to lead to recovery of the MSO will not be accomplished in alternative 1, but will in alternative 3. It appears that this paragraph was written to support alternative 2.

4.38, page 4-43

9-29 The discussion of alternative 3 is inadequate. Alternative 3 does meet the short-term guidelines of the Recovery Plan. Again, this only states those facts that lead to support of alternative 2, and is not complete. The Recovery Plan states that the short-term guidelines are to be applied until the species is delisted in an estimated 10-15 years. The long-term guidelines are to be enacted after this occurs. Delete the last sentence of the seventh paragraph on this page. It refers to draft guidance that was changed.

Chapter 6

Page 6-1

The name of the Service employee is spelled incorrectly. One "l" should be deleted (Michele).

Conclusion

9-30 The Service appreciates the opportunity to have attended several interdisciplinary team meetings for this project in the last year and to work closely with District personnel. The Service's goal in doing so was to assist in the development of an alternative that was acceptable in terms of effects to the MSO. Alternative 3 is that alternative. The Service has serious concerns regarding alternatives 1 and 2 and the effects to MSO critical habitat. The Service feels strongly that the best available information on the MSO should be used to select an alternative. At this point in time, the best information is reflected in the Draft MSO Recovery Plan. The Recovery Plan emphasizes both a short and long-term strategy. The short-term strategy is to be implemented until the MSO is delisted, an estimated 10 to 15 years. The Service believes this strategy should

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**9-28** This section has been rewritten to reflect the criteria in the final MSO Recovery Plan. The footnote on Table III.B.1 (Volume 1, Part 3, Page 92, MSO Recovery Plan) states that 20 square feet of basal area "of oak must be provided as a threshold/target condition". This footnote does not reflect your statement regarding oak made at the time when only the draft Recovery Plan was available.

**9-29** Your points are incorporated into the revised section as each of the alternatives were evaluated against the final MSO Recovery Plan.

**9-30** Thank you for your support of Alternative 3.



be implemented. This is particularly important given that the Pocket/Baker area is within the Upper Gila Mountain Recovery Unit, considered the "source" population of MSO. The Service strongly supports selection of alternative 3, which we believe to be an adequate compromise between treating mistletoe and managing for the recovery of the MSO. The Service cannot support selection of alternatives 1 or 2.

Thank you for the opportunity to comment on this project. If we can be of further assistance, please contact Michele James or Bruce Palmer.

Sincerely,

for Sam F. Spiller
State Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (AES)
State Supervisor, Fish and Wildlife, Albuquerque, NM
Forest Supervisor, Coconino National Forest, Flagstaff, AZ
Director, Arizona Game and Fish Department, Phoenix, AZ

THE STATE OF ARIZONA

GAME & FISH DEPARTMENT

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Thomas W. Spalding

July 27, 1995

Bruce Greco
District Ranger
Long Valley Ranger District
HC 31 Box 68
Happy Jack, Arizona 86024

Re: Comments on the Pocket/Baker Ecosyetem Draft Environmental Impact Statement (EIS)

Dear Bruce,

The Arizona Game and Fish Department wants to compliment you and your staff on the quality of analyeie in the Pocket/Baker Draft EIS. Your efforte to project temporal effects well into the future and your monitoring plan are especially noteworthy. We strongly support your proposal to reduce road deneities. Signing of closed/obliterated roads will aleo allow our Commissioned Officers to help with enforcement. However, the Department hae the following commente on epecific iesues.

BURNING:
While we generally support preecribed burning, existing fuel loads make preciee control of fires difficult. Results of recent prescribed burning on the Coconino National Foreet have included impacts beyond what was projected or desired. Therefore, since fire impacts are less predictable and timber harveet is more precise, we would recommend burning first followed by logging to best accomplieh your stated objectives in whichever alternative you eelect.

MISTLETOE:
You have preeented a detailed discuseion of tradeoffs aseociated with the timing of mietletoe treatment. The Draft EIS etates that deeired canopy cover for spotted owl habitat will remain for 50 years but then decline. Thie projection appeare largely baeed on Hawksworth's 32 year study of tree mortality near Tusayan. We recognize that mistletoe interacts with treee on a time ecale which few etudiee have meaeured. Therefore, studiee such as Hawksworth's are extremely valuable. We face the same need for long-term





**10-1** As stated in the DEIS (Chaptcr 2), burning may occur either prior or after the timber harvest operation where both operations are to occur. Thcre is a nccd to havc this flexibility because weather, fuel moisture, fuel structure and burning windows all determine how a unit is to be burncd. Monitoring from the Aztec II burn sitcs indicates the District has good control over the result of prescribed burning.

**10-2** Though thc Hawksworth and Geils study is the only long term study in the Southwest on thc effects of dwarf mistletoe, there have been numcrous other studics (in the DEIS) that clearly demonstrate the immediate physical effects of dwarf mistletoe on pondcrosa pine. Whcn considered together, thesc studics seemed to indicatc that thcre will be a decline in canopy closures in the future. We agree that the timing of these future effects is only an estimate and extrapolation is a risky business. Wc also agrec that sites and vegetative conditions diffcrent than the study sitc will make a diffcrcnce on the timing of the canopy declines (stated in thc DEIS, page 4-5). Thcrefore, we crrcd on the conservative side when proposing trcatments by concentrating on trcating the high infectcd stands and the young stands in which a preponderancc of studies indicate there is a high risk of mortality.

wildlife research which seldom exists. We would caution against extrapolation beyond the time scale of Hawksworth's study or the climatic and edaphic conditions of that study area. Additionally, your document discusses the beneficial effects to tree growth of nutrient cycling expected from prescribed burning and from thinning, whether by fire or chainsaw.

10-3 For the following reasons we consider your projections of stand deterioration from mistletoe to be overly pessimistic: (1) your current projections of maintaining desirable canopy densities well into the future (2) we consider Pocket/Baker to have better growing conditions than on Hawksworth's study site, (3) projections are for a burning cycle possibly as frequent as every 4-5 years, given the thinning of mistletoe that may occur by fire, (4) the anticipated stimulation of tree growth from nutrient cycling by fire. Therefore, for this site at this time, we support less aggressive management of mistletoe by logging and more emphasis on testing and monitoring the effects of fire on mistletoe.

GRAZING:

10-4 In the Grazing Management section of the EIS there are qualitative objectives, such as "...maintain and improve ground cover vegetation...", but no quantitative objectives for utilization, ground cover or vegetation attributes. Similarly, in the Monitoring Plan there is direction to measure many plant and range attributes, but with no standard set as an objective, the monitoring will give little guidance. We would hope to see quantitative objectives set which, if not met within a specified time, would trigger a predetermined adjustment in the grazing plan.

10-5 There are several comments related to elk-livestock issues that merit further discussion. First, the success of the grazing plan should not depend on the concept of elk foraging patterns predictably following the livestock grazing rotation. If burned pastures are to be rested from livestock grazing (as currently planned) elk may concentrate on the recently burned sites rather than the recently grazed (by livestock) pastures, and may remain in those pastures for consecutive years. If this would preclude use by livestock where would the permittee go? We recommend a more comprehensive assessment of the interrelationship between fire, livestock and elk. A second concern is whether there has been a recent Production-Utilization study to show that capacity exists for the current grazing use by livestock and wildlife. If not, we would reiterate the need for criteria to adjust grazing based on the monitoring.



**10-3** As in the response to comment 10-1, fire may occur before or after logging operations. Thinning by fire is an uncontrolled event; that is, to target mortality or control of dwarf mistletoe is difficult at best (included in the FEIS, see Chapter 6).

**10-4** We have included quantitative objectives in the FEIS.

**10-5** The proposed grazing scheme has a graze half/rest half component allowing sufficient flexibility to accommodate both elk and burning. Monitoring on both the Red Hill and Pivot Rock allotments gives good indications what the elk are going to do (included in FEIS, Chapter 5). If the elk pattern of use is different on the proposed grazing scheme, then the monitoring will detect the changes and adjustments will be made.

Bruce Greco
7/27/95
Page 3

10-6 Another concern related to the understory vegetation is the expectation that reintroduction of fire and adjustments in grazing will create a more lush, dense and diverse plant community. We also hope this will occur. However, observations from the Chimney Springs burn study plots near Flagstaff suggest that even after repeated fires over a twenty year period, understory cover may remain relatively sparse and feature many early seral/invader species.

10-7 TIMBER HARVEST:
Harvest proposals (i.e. pg. 2-14) discuss leaving clumps, leaving residual basal area targets and removing mistletoe but are ambiguous whether residual targets are for the stand or for clumps within a stand. Also, where basal area and mistletoe objectives may conflict there should be priorities set so the timber markers will have clear direction.

10-8 CUMULATIVE EFFECTS:
On page 4-11 the conclusion to the "Dense Canopy---Dwarf Mistletoe" section describes the issue that caused the writing of an EIS rather than an EA. The fundamental decision to be made is whether to retain spotted owl habitat now and possibly lose it in the future because of mistletoe or degrade owl habitat now to possibly improve it in the future. The key information needed to make that choice is the cumulative effects of that decision on the overall owl habitat available now and in the future. That information and analysis is missing in this document.

Given the lack of cumulative effects analysis we recommend selection of Alternative 3 which will comply with the Draft Mexican Spotted Owl Recovery Plan.

Thank you for the opportunity to comment on this Draft EIS.

Sincerely,

John G. Goodwin, Jr.
Habitat Specialist
Flagstaff Region



**10-6** The burning and grazing proposals are designed from a lot of field experience, monitoring of similar projects, and scientific studies. While we do not disagree that expected results will occur on all sites, the literature and field experience are overwhelmingly in our favor that improvements in the understory will generally result. Incidentally, the Chimney Springs site is not grazed by livestock.

**10-7** The basal areas described are for the stand as a whole. This point has been clarified in the FEIS. The prescriptions have been refined to give direction when mistletoe and residual basal guidelines conflict.

**10-8** Thank you for your support of Alternative 3. The lack of information you describe is just one of the reasons an EIS was written. With the completion of the West Clear Creek Ecosystem Needs Assessment, we have a larger landscape idea of the available owl habitat.

You are also apparently defining the degradation of owl habitat by the fact that Alternative 2 exceeded established guidelines in the draft MSO Recovery Plan. Those guidelines are no longer valid in the final Recovery Plan. Therefore, degradation of owl habitat based on those assumptions is no longer valid. The FEIS evaluated all alternatives against the criteria established in the final MSO Recovery Plan and disclosed effects to the MSO accordingly.

**Rick Erman**

3435 E. Windrose Dr.
Phoenix, Arizona 85032
(602) 971-2388

July 29, 1995

Mr. Bruce Greco, District Ranger
Long Valley Ranger District
HC 31 Box 68
Happy Jack, Arizona 86024

Dear Mr. Greco,

11-1 Please accept this letter as an endorsement of Alternative #2 as proposed for the Pocket/Backer Ecosystem Area.

Sorry that it is late, between work, family and the "95" rush to complete grazing permits, things have been a little hectic.

Please keep me on the list of those interested in this project.

Sincerely,

Rick Erman



11-1 Thank you for your support of Alternative 2.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

JUL 3 1 1995

Bruce C. Greco
District Ranger
Long Valley Ranger District
Attn: Pocket/Baker Ecosystem
HC 31 Box 68 Happy Jack, AZ 86024

Dear Mr. Greco:

The Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for the project entitled Pocket/Baker Ecosystem, Coconino National Forest, Long Valley Ranger District, Coconino County, Arizona. Our review is pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and Section 309 of the Clean Air Act.

The Forest Service has evaluated several alternatives for managing the Pocket/Baker analysis area which is located atop of the Mogollon Rim at the south-central portion of the Coconino National Forest next to the Tonto National Forest. The area encompasses approximately 23,200 acres and includes prominent geographical features such as the Baker Butte; Milk Ranch, Strawberry, and Nash Points; the Mogollon Rim; Five-Mile and 29-Mile Lakes and Fossil Creek Wilderness (Calf Pen and Sandrock Canyons). The Forest Service developed alternatives based on a landscape ecosystem analysis of the area and the need to address six significant management issues: effect of dwarf mistletoe infection on the sustainability of Mexican Spotted Owl nesting/roosting habitat, absence of fire in the ecosystem, lack of vegetative seral stages and diversity, decline of aspen in the ecosystem, demand for recreation, and watershed damage and safety problems with the transportation system.

All alternatives, except the no action alternative (alternative 4), include prescribed fire on approximately 17,000 acres; restoration of 50 acres of scattered aspen sites; reduction of hazards along State Highway 87; implementation of improved range management; treatment of dwarf mistletoe infected sites by timber harvest; and partnerships to restore Forest Service road 608 and re-open Cinch Hook snowplay area for safe winter recreation. Alternatives differ by the type and extent of Mexican spotted owl limitations applied to management and the number of acres harvested. Alternative 1 would be limited by Interim Directive #2 and dispersal habitat guidelines for the management of the Mexican spotted owl and would include about 5,650 acres of harvest. Alternative 2, the preferred alternative, would not be limited by the dispersal habitat guidelines and would harvest on about 6,800 acres. Alternative 4 would be limited by the Draft Mexican Spotted Owl Recovery Plan and would harvest on about 4,200 acres.

EPA commends the Forest Service for evaluating the area based on a landscape ecosystem analysis approach. We applaud the attempt to address significant management issues which are obviously complex and crucial to the current and future health of the forest ecosystem. We agree that these issues must be addressed soon. Nevertheless, we object to the components of the preferred alternative which exceed management activity thresholds in the Draft Mexican Spotted Owl (MSO) Recovery Plan and dispersal habitat guidelines (pg. 4-29). We support the goal of improving forest health and assuring protection of existing and future recruitment of MSO foraging and nesting/roosting habitat. However, we do not believe the DEIS has persuasively demonstrated that future long-term benefits (30-60 years from now) from proposed harvesting to treat mistletoe out weight the short-term impacts. Furthermore, the DEIS does not provide sufficient evaluation of potential impacts to water quality and air quality.

Because of the above objection, EPA has classified this DEIS as category EO-2, Environmental Objections - Insufficient Information (see attached "Summary of the EPA Rating System"). We believe changes to the preferred alternative should be seriously considered to ensure present and future MSO species viability and to adequately protect the environment. Our detailed comments are enclosed.

We appreciate the opportunity to review this DEIS. Please send only two copies of the Final EIS to this office at the same time it is officially filed with our Washington, D.C. office. We are available to discuss our comments and to work with you to formulate a management framework which will ensure adequate protection of the environment. If you have any questions, please call Mr. David J. Farrel, Chief, Office of Federal Activities at (415) 744-1584, or invite your staff to call Ms. Laura Fujii at (415) 744-1579.

Sincerely,

Deanne Wieman, Director
Office of External Affairs

Enclosure: (7 pages)

Filename: pocketba.dei
002465

COMMENTS

Mexican Spotted Owl

The DEIS clearly states that the Pocket/Baker ecosystem is part of an area which contains the majority of known Mexican spotted owls and is a criticel area for their recovery (pg. 3-9). Furthermore, since the preferred alternative would not be consistent with the MSO Recovery Plan, the Fish and Wildlife Service (USFWS) may rule the action as an adverse effect (pg. 4-29). We note that there is very little difference between alternatives regarding future changes in ecological features (e.g., canopy structure (pg. 4-10), vegetation stand structure (pg. 4-50)) that are critical elements of MSO habitat. Although the Forest Service states that the benefit of mistletoe treatment will occur in 30-60 years, very little concrete data or study reports are provide to support this contention. Thus, we urge the Forest Service to continue to work with the USFWS to develop a conservative forest management strategy which will be more consistent with MSO recovery strategies; and ensure preservation of MSO species viability, alternative menegement options, multi-species viability, biodiversity, end healthy aquatic and terrestrial ecosystems on a lendscape and watershed level.

12-1

The DEIS discussion regarding environmental consequences to the MSO is very confusing. For instance, as stated above, the DEIS clearly states there are conflicts with the MSO Recovery plan due to mistletoe treatment while later the DEIS states thet harvest levels would have no effect (pg. 4-40) on the owl. In addition, the evaluation appears to focus on individual impacts (e.g., fire, harvests) versus the total potential impact to tne MSO. The FEIS should clearly and persuasively demonstrate that all short-term impects from management treatments are not greater then long-term benefits. Data supporting predicted long-term benefits from harvesting and mistletoe treatments should be provided. Section 7 consultation with the USFWS should be described in the FEIS. We recommend that USFWS Section 7 correspondance and their Coordination Act Report be included as an appendix in the FEIS.

12-2

12-3

The FEIS should also diecuss in greater depth possible monitoring and mitigation measures. For example, the DEIS states that mitigation for fire caused impacts to MSO habitat would be to limit prescribed burns to no more then 25% of an MSO menagement territory (pg. 4-20). However, under the preferred alternative, management territory 421 will be almost 50% burned (pg. 4-24, Figure 4-6). The FEIS should fully address potential impacts to MSO management territory 421 and possible mitigation measures. The DEIS also states that it is currently impossible to create desirable uneven-age vegetation structure due to the

12-4

12-5





**12-1** We agree that there is very little concrete data to project long term effects of dwarf mistletoe, but a number of studies when considered together point to a definite trend (see response to comment 10-2). While we concede that there may be site factors or cumulative conditions that may lengthen or reduce the anticipated time frame of canopy declines, not a single respondent to the DEIS has pointed out contrary references or flawed logic in our projection analysis. Therefore, we still feel that there will be substantial effects from dwarf mistletoe in the future.

The final MSO Recovery Plan changed many of the strict guidelines that prompted the EIS. All alternatives were evaluated against the criteria of the final MSO Recovery Plan (see Chapter 8, FEIS).

**12-2** We agree that the display of environmental effects was confusing. This section has been rewritten.

**12-3** Section 7 Consultation is available as part of the project record and is summarized in the Record of Decision.

**12-4** The limit of 25% is per year (as stated in the DEIS). Though the territory will have almost 50% of the area burned, it will be burned over a long period with years of rest in between (also stated on page 4-20 in the DEIS).

**12-5** The description of Issue #3 (Lack of Seral Stages and Diversity) has been expanded to better disclose the desire and methods for creating uneven-aged conditions.

current lack of larger vegetation components (e.g., large trees, snags). The FEIS should evaluate potential measures which can be taken to encourage the development of uneven-age vegetation structures.

Water Quality

The DEIS has very limited information regarding potential impacts of proposed management activities on water quality or aquatic and wetland habitats.

1. The FEIS should discuss the proposed project's compliance with State and local water quality management plans and State-adopted, EPA-approved water quality standards. Provide information on how the State non-point source program will be incorporated into the proposed project. EPA recommends that the project be fully coordinated with the appropriate Regional Water Quality Control Board to ensure protection of water quality and maintenance of beneficial uses.

2. The FEIS should consider and discuss the Federal Antidegradation Policy (40 CFR 131.12) which is designed to help implement the Clean Water Act (CWA). The Antidegradation Policy states that where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full intergovernmental coordination and public participation, that allowing lower water quality is necessary to accommodate important economic or social development. Even then, the State shall assure water quality adequate to fully protect existing uses.

12-6

3. Evaluate the potential of the proposed project to cause adverse aquatic impacts such as increased siltation and turbidity; changes in the direction of stream flow, substrate, dissolved oxygen, and temperature; and habitat deterioration. Include a description of sedimentation and water quality impacts which may already be occurring.

4. Discuss specific monitoring programs that will be implemented before and after proposed actions to determine potential impacts on water quality and beneficial uses, and whether maintenance and protection of water quality can be guaranteed.

12-7

5. Identify critical fisheries habitat, especially spawning and rearing areas; and other sensitive aquatic sites such as wetlands which are present. Outline past and potential beneficial uses of





12-6 To respond to the objectives defined by Congress in the Federal Water Pollution Control Act and by the State of Arizona as defined in the Arizona Environmental Quality Act (1986), the Forest Service and the State of Arizona have entered into an intergovernmental agreement. As a result the Forest Service agrees to develop and utilize Best Management Practices (BMP) for each project or plan. The BMP's are designed to limit nonpoint source pollution from activities such as prescribed burning, timber harvest operations, and road construction. These BMP's are standard operating procedures. There are no unusual projects proposed in any of the alternatives that do not have BMP's.

12-7 There are no aquatic or wetlands within the Pocket/Baker analysis area. There are no critical fisheries habitats within the Pocket/Baker analysis area. Critical habitat for the Little Colorado spinedace (outside of the analysis area) is discussed in the DEIS on page 3-35, 3-36, and 4-61.

these areas, and discloss potential impacts from the proposed project.

12-8 6. Indicate what measures will be taken to protect critical fish and wildlife habitat areas from potential adverse effects of the proposed project. The feasibility of proposed mitigation measures should be fully demonstrated.

Section 404 Comments

The FEIS should identify impacts to water, floodplains, and wetlands, including identification of Section 404 Clean Water Act requirements and proposals to ensure compliance with these requirements.

EPA will review the proposed action for compliance with the Federal Guidelines for Specification of Disposal Sites for Dredged or Fill Materials (40 CFR 230) [hereafter referred to as the Guidelines], promulgated pursuant to Section 404(b)(1) of the Clean Water Act (CWA). To comply with the Guidelines, the proposed action must meet all of the following criteria:

12-9
- There is no practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem (40 CFR 230.10(a)).

- The proposed action does not violate State water quality standards, toxic effluent standards, or jeopardize the continued existence of federally listed species or their critical habitat (40 CFR 230.10(b)).

- The proposed action will not cause or contribute to significant degradation of waters of the United States, including wetlands (40 CFR 230.10(c)). Significant degradation includes loss of fish and wildlife habitat, including cumulative losses.

- All appropriate and practicable steps are taken to minimize adverse impacts on the aquatic ecosystem (i.e., mitigation) (40 CFR 230.10(d)). This includes incorporation of all appropriate and practicable compensation measures for unavoidable losses to waters of the United States, including wetlands. The FEIS should fully address the feasibility of "in-kind" habitat mitigation measures.

Air Quality

12-10 The FEIS should provide a detailed discussion of air quality standards, Prevention of Significant Deterioration (PSD) requirements (class I areas), ambient conditions, and potential





**12-8** Evaluation of effects to critical habitat for the Mexican spotted owl is accomplished using the final Recovery Plan for the MSO. Our analysis and the Section 7 Consultation with the US Fish and Wildlife Service accomplishes that evaluation for both the MSO and other Threatened, Endangered and Sensitive species. The Wildlife Assessment Report and the Section 7 Consultation correspondence are part of the project record.

**12-9** See response to comment 12-6.

**12-10** The State of Arizona statutes divide jurisdiction over air pollution sources between the State and the counties. The State has exclusive jurisdiction over air pollution sources having potential total emissions of 75 or more tons per day, but defer some jurisdiction to the counties. National Forest lands ordinarily would come under county air control pollution control districts. Consequently, the State (Arizona Department of Environmental Quality, ADEQ) has complete jurisdiction over air quality monitoring in the Pocket/Baker area. The Forest Service operates under guidelines set forth in the State Implementation Plan (SIP) as required by the Clean Air Act 1970 (amended 1977, 1990).

Consequently, clearances for burning are issued by the State on a daily basis. The Forest Service conducts prescribed burns when clearances are obtained.

We have included in the FEIS discussions on standard operating procedures. These procedures include consultation with the State prior to prescribed burning.

air quality impacts of the proposed project, including cumulative and indirect impacts. Include a description of current and proposed fire management policy, smoke/air quality management, fire suppression techniques, and prescribed burning activities and their impacts on air quality.

Federal agencies are required by the Clean Air Act to assure that actions conform to an approved air quality implementation plan. Since the proposed action is located in a nonattainment area (pg. 3-17), pursuant to §176(c) of the Clean Air Act (CAA), as amended November 15, 1990, there is an affirmative responsibility imposed on the Forest Service to assure that their actions conform to the attainment plan as approved for the area. It is these provisions of the CAA which address whether or not the project would interfere with attainment or maintenance. Pursuant to §176(c), conformity to an implementation plan means:

12-10

"conformity to an implementation plan's purpose of eliminating or reducing the severity and number of violations or the National Ambient Air Quality Standards and achieving expeditious attainment of such standards; and

"that such activities will not (i) cause or contribute to any new violation of any standard in any area; (ii) increase the frequency or severity of any existing violation of any standard in any area; or (iii) delay timely attainment of any standards or any required interim emission reductions or other milestones in any area."

Furthermore, on March 15, 1993, EPA published a proposed rule in the Federal Register on "Determining Conformity of General Federal Actions to State or Federal Implementation Plans." The proposed rule applies to federal activities not related to transportation plans, programs, and projects and which occur in non-attainment or maintenance areas. The proposed rule requires that conformity determinations be made for each (non-transportation) federal activity with a total of direct and indirect emissions of air pollutants exceeding de minimus thresholds. The Clean Air Act prohibits federal approval of a project for which conformity with the SIP cannot be assured. These regulations should be examined for applicability to the proposed action.

12-11

EPA understands and supports the use of prescribed burning to reintroduce fire into the forest ecosystem. However, we are concerned with the potential feasibility of relying only on this tool, given the probability for more stringent particulate standards (pg. 4-22) and the very poor atmospheric ventilation of the area (pg. 3-36). We encourage the Forest Service to work with other land resource managers and agencies in the development of



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**12-11** If future particulate standards change significantly to the point that part or all of the proposed projects are not able to be implemented, then an amended EIS will be prepared. Our proposal to utilize as much of the wood biomass prior to burning is certainly a measure which reduces the amount of burning and/or particulates.

12-11 innovative fire management strategies and fuel reduction methods. The FEIS should describe potential fallback options in the event that the level of prescribed burning is not possible.

**National Environmental Policy Act**

12-12 1. We are concerned with the scoping process which occurred for this project. The DEIS was released before closure of the formal Notice of Intent comment period. The intent of the scoping process is to provide the opportunity for the Forest Service to obtain input from the public on potential issues, the issues to be analyzed in depth, project alternatives, pertinent additional information, potential environmental impacts and possible cooperating agencies. Thus, the scoping process is not just a profunctory procedural requirement but a significant part of the planning process. While we understand the faulty timing was a result of problems with the Federal register process, we do not believe it is an excuse for the lack of public participation. The FEIS should clearly demonstrate that there has been adequate opportunity for the public to participate and to contribute to the debate regarding significant issues, management alternatives, and potential project impacts.

12-13 2. The evaluation of environmental consequences should be revised to clearly depict the differences between each alternative. The current evaluation does not include a separate discussion of potential impacts of each alternative but includes a general discussion of impacts for Alternatives 1, 2, and 3. Thus, it is very difficult to determine which impacts are attributed to each alternative. We recognize the differences may be small and appreciate the charts which attempt to illustrate the changes between alternatives. We recommend providing a comparative summary narrative with the comparative charts.

12-14 3. NEPA states that the EIS should evaluate potential direct, indirect, and cumulative impacts of the project. Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time [40 CFR Section 1508.7]. The FEIS should describe management prescriptions and plans for adjoining areas, including the areas within the neighboring Tonto National Forest. Potential direct, indirect, and cumulative impacts from these actions should be evaluated. We also encourage the Coconino National Forest and Tonto National Forest to collaborate on compatible and complementary projects and management strategies along their joint borders.





**12-12** The section on public participation has been expanded to reflect the numerous participation opportunities that were available. We did not receive any concerns from prospective commentators that the timing of the Notice of Intent or the draft review period was a problem negating their opportunities to comment.

**12-13** We agree that the Environmental Consequences section was difficult to read. We have revised and rewritten this section.

**12-14** Cumulative impacts on a regional scale was done under the Coconino National Forest Land Management Plan (1987 and amendments). Cumulative effects were considered: timber harvests (page 3-20), historical logging/grazing/fire exclusion interactions (pages 3-23 to 3-29), and forest fuel treatments and wildfires (pages 3-30 and 3-31). In addition, cumulative effects from past activities manifest themselves in current conditions. These were listed in pages 3-1 to 3-37. Since you did not list specific effects, we cannot further address your comment.

General Comments

12-15 1. We strongly recommend expanding and developing the monitoring plan. For instance, validation and effectiveness monitoring methods for timber harvests, mistletoe treatments, and aspen treatments should be described in detail to ensure management goals are being met. We also recommend including monitoring measures to track potential impacts to water quality, air quality, and species viability.

12-16 2. The FEIS should include additional historical information regarding past management within the Pocket/Baker ecosystem. Describe the prescriptions and direction specified for the area within the Coconino Land and Resources Management Plan. The DEIS indicates there are existing slash piles on the Mogollon Rim and implies that timber harvesting has occurred in the past. The FEIS should describe these past activities. Include a discussion of the management priority setting process and the rationale for focusing on the Pocket/Baker ecosystem area.

12-17 3. A significant issue is the management of mistletoe infection to sustain the development of MSO nesting/roosting habitat. The primary method of control proposed is extensive harvesting of contaminated trees. The FEIS should describe the effectivsness of the proposed harvesting methods and discuss other potential tools in effectively fighting this disease.

12-18 4. The preferred alternative includes timber harvest on about 6,800 acres. The FEIS should describe the volume of past, existing, and proposed timber harvest; and the percentage of acres harvested. Include a discussion of the proposed harvest methods, equipment to be used, and the implications to the local economy. We recommend a pictorial representation of the effect of the different proposed harvest treatments, before and after treatment.

12-19 5. The FEIS should provide a clear description and explanation of Vegetation Stand Structure (VSS), Q factors, even-age and uneven-age measures. The current discussion of these items is confusing. Include information on how these items were developed, their connection to each other, and how they are used.

12-20 6. The FEIS should include additional information regarding the existing transportation system. For instance, what is the current road density and miles of road, prior to implementation of the Resource Access/Transportation Management program?

12-21 7. We strongly recommend the FEIS include an appendix with a list and explanation of all acronyms used.





**12-15** We reviewed and revised the monitoring plan.

**12-16** The past harvest activities section on page 3-20 has been expanded.

**12-17** A section dealing with the effectiveness of dwarf mistletoe treatments has been added to the FEIS. The use of fire as a tool is also discussed.

**12-18** Past harvest levels have been added to the section on past logging. A pictorial representation, as you suggested, has also been added. The effect to the local economy of timber harvesting was considered in the Coconino National Forest Land Management Plan.

**12-19** The glossary in the FEIS has been expanded to explain VSS. The terms even-aged and uneven-aged have also been included in the glossary of terms.

**12-20** The levels of road density prior and after each of the alternatives has been added to the environmental consequences section (see Chapter 8, FEIS)

**12-21** As you suggest, a list of acronyms has been added to the glossary in the appendix.

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
600 Harrison Street, Suite 515
San Francisco, California 94107-1376

ER95/508

August 10, 1995

Mr. Bruce C. Greco
Long Valley Ranger District
Coconino National Forest
HC 31 Box 68
Happy Jack, AZ 86024

Dear Mr. Greco,

13-1

The Department of the Interior has received and reviewed the Draft Environmental Impact Statement (DEIS) for the Pocket/Baker Ecosystem Management Project, Coconino National Forest, Long Valley Ranger District, AZ.

Please consider the letter of July 24, 1995 you received from the Arizona Ecological Services State Office of the U.S. Fish and Wildlife Service as also representing the Department of the Interior's comments.

If you have any questions, kindly contact me at 415/744-4090.

Sincerely,

Patricia Sanderson Port
Regional Environmental Officer

cc: Director, Office of Environmental Policy and Compliance
Regional Director, FWS, Albuquerque, NM
Field Supervisor, FWS State Office, AZ



**13-1** The responses to the July 24, 1995 letter are numbered 9-1 to 9-30.

## APPENDIX C
## PROJECT RECORD INDEX

| DOC # | DOCUMENT NAME | AUTHOR | ADDRESSEE | DATE |
|---|---|---|---|---|
| | | | | |
| 1 | Pest Management Input | Wilson | File | 7-12-89 |
| 2 | Initial Scoping Meeting Notes | Gaither | File | 8-15-89 |
| 3 | Soil and Water Input | Robertson | File | 10-89 |
| 4 | LMP S&G's per MA | Gaither | File | 10-1-89 |
| 5 | Archaeology Input | Baldwin | File | 10-10-89 |
| 6 | IDT Meeting Notes | Blake | File | 10-11-89 |
| 7 | Silviculture Input | Koyiyumptewa | File | 1-11-90 |
| 8 | Pest Management Input | Wilson | File | 1-18-90 |
| 9 | IDT Meeting Notes | Blake | File | 1-19-90 |
| 10 | Stone Forest Industries Input | Kingsbury | Greco | 1-23-90 |
| 11 | Map - Strawberry Timber Sale | | File | 3-22-90 |
| 12 | EA & Implementation Checklist | Blake | File | 1-4-90 |
| 13 | Request for T&E List | Greco | FWLS | 10-10-90 |
| 14 | Timber Planning | Greco | K. Applequist | 11-12-90 |
| 15 | Request for T&E List | Greco | FWLS | 2-5-91 |
| 16 | T&E Species List | Spiller | Greco | 2-13-91 |
| 17 | Wilderness Boundaries Memo | F. Robertson | Regional Frstr | 4-30-91 |
| 18 | Archaeology Inventory Report | SHPO | FS | 8-29-91 |
| 19 | Poster Scoping Notice | Greco | E. Smith | 10-23-91 |
| 20 | Poster/Location Map | | | |
| 21 | Position Statement - Pocket | Fleishman | | 1-5-92 |
| 22 | IDT Meeting Notes | Blake | | 1-22-92 |
| 23 | IDT Schedule | Gaither | IDT | 4-17-92 |
| 24 | DFC Form - Pocket 10K | | | 5-22-92 |
| 25 | IDT Meeting Notes - DFC/PA | Blake | IDT | 5-22-92 |
| 26 | Phone Documentation - Robbins | Blake | IDT | 5-14-92 |
| 27 | Insect and Disease Input | Wilson | Blake | 6-2-92 |
| 28 | Field Trip Notes | Gaither | | 6-7-92 |
| 29 | IDT Meeting Notes | Gaither | IDT | 6-12-92 |
| 30 | Proposed Action - Pocket 10K | Greco | Public | 6-24-92 |
| 31 | Phone Documentation - Ashby | Gaither | | 6-16-92 |
| 32 | Map - Elk Travel Corridors | Patterson | | 6-26-92 |
| 33 | Field Trip Notes/Contacts | Gaither | IDT | 7-11-92 |
| 34 | Phone Documentation - Brown | Greco | | 7-13-92 |

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|---|---|---|---|---|
| 35 | Phone Documentation - Ranft | Gaither | | 7-16-92 |
| 36 | Issues Input - Silviculture | E. Paul | IDT | 7-17-92 |
| 37 | Response to Field Trip | Mackin | Gaither | 7-14-92 |
| 38 | Phone Documentation - Hunt | Gaither | | 7-20-92 |
| 39 | Public Input | Rasmussen | District Ranger | 6-30-92 |
| 40 | Issues Input - Range | Hannemann | Greco | 7-23-92 |
| 41 | Public Input | Ferrante | Greco | 7-27-92 |
| 42 | IDT Notes | Gaither | IDT | 7-29-92 |
| 43 | Letter - Re: Oral History | Gaither | L. Hunt | 8-5-92 |
| 44 | Pocket 10K PC Database | Gerritsma | | 8-6-92 |
| 45 | Public Input | Galbreath | Whitney | 7-23-92 |
| 46 | Phone Documentation - Gobus | Gaither | | 8-10-92 |
| 47 | Phone Documentation - Galbreath | Gaither | | 8-12-92 |
| 48 | T&E List From FWLS | Metz | Greco | 8-5-92 |
| 49 | Input - ADEQ | Meyer | Greco | 8-12-92 |
| 50 | Phone Documentation - Kessler | Gaither | | 9-4-92 |
| 51 | Public Meeting Notes | Gaither | | 9-2-92 |
| 52 | Phone Documentation - Halla | Gaither | | 9-25-92 |
| 53 | IDT Meeting Notes | Gaither | | 10-13-92 |
| 54 | Phone Documentation - Spies | Gaither | | 10-16-92 |
| 55 | 608 Road Meeting | Blake | | 10-22-92 |
| 56 | 609 Road Input - ADEQ | Jagow | Greco | 11-12-92 |
| 57 | Summary of Timber Treatments | Blake | IDT | 2-1-93 |
| 58 | Public Contacts | Larson | | 7-3-93 |
| 59 | Public Notice for Field Trip | Greco | | 10-26-93 |
| 60 | IDT Meeting Notes | Brill | IDT | 11-17-93 |
| 61 | IDT Meeting Notes | Blake | IDT | 11-30-93 |
| 62 | Range Input | Hannemann | | 11-30-93 |
| 63 | Recreation Input | | | 12-10-93 |
| 64 | Insects Input | Wilson | IDT | 12-10-93 |
| 65 | Watershed Input | McCadden | IDT | 12-10-93 |
| 66 | Watershed/Roads Input | McCadden | IDT | 12-10-93 |
| 67 | IDT Meeting Notes | Blake | IDT | 12-13-93 |
| 68 | Fuels Input | | | 12-13-93 |
| 69 | Phone Documentation - Smith | Fleishman | | 12-15-93 |
| 70 | Habitat Input | Whitney | IDT | 12-16-93 |
| 71 | Status Letter to Publics | Greco | Various | 12-20-93 |
| 72 | Grazing Summary Input | Hannemann | | 12-20-93 |
| 73 | Recreation/Lands Input | | | 12-14-93 |

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|---|---|---|---|---|
| 74 | Range/Watershed Meeting Notes | Blake | | 12-21-93 |
| 75 | IDT Meeting Notes | Blake | | 12-21-93 |
| 76 | Request/Response to Meeting | Greco | Various | 1-3-94 |
| 77 | IDT Meeting Notes | Blake | | 1-14-94 |
| 78 | Bracken Fern Input | Peck | IDT | 1-23-94 |
| 79 | Pine/Strawberry Publics | Greco | Blake | 1-26-94 |
| 80 | 4WD Public Contact Memo | Barth | Blake | 1-27-94 |
| 81 | Proposed Action - Pocket/Baker | Greco | Various | 2-1-94 |
| 82 | IDT Comments to PA | Various | | 2-3-94 |
| 83 | Insects Input | Wilson | IDT | 2-4-94 |
| 84 | Reply to PA - Verde NRCD | Thompson | Blake | 2-10-94 |
| 85 | Dwarf Mistletoe Input | Fairweather | Blake | 2-11-94 |
| 86 | Reply to PA - Moniak | Moniak | Blake | 2-14-94 |
| 87 | Reply to PA - Phone Contact | Various | Various | 12-16-94 |
| 88 | Reply to PA - REC | Erman | Greco | 12-21-94 |
| 89 | IDT Meeting Notes | Blake | | 2-23-94 |
| 90 | Request for PA | McMenamin | Greco | 2-27-94 |
| 91 | Road Closures | Keller | Greco | 2-26-94 |
| 92 | IDT Meeting Notes | Blake | | 2-28-94 |
| 93 | ADOT Meeting Notes | Blake | | 3-3-94 |
| 94 | Personal Contact Memo | Greco | Moniak | 3-9-94 |
| 95 | Public Input | Elmquist | Greco | 3-11-94 |
| 96 | Public Input | Jaskulski | Greco | 3-11-94 |
| 97 | Hollistic Range Mgmt Notes | Blake | IDT | 3-15-94 |
| 98 | Archaeological Clearance | Hanson | | 3-31-94 |
| 99 | IDT Meeting Notes | | | 4-4-94 |
| 100 | TES Input | Robertson | Gerritsma | 4-14-94 |
| 101 | Range/Historical Input | Hannemann | | 4-21-94 |
| 102 | ADOT Input - SH87 Hazards | Woolwine | Gerritsma | 4-27-94 |
| 103 | Visual Resource Analysis | Gerritsma | | 5-1-94 |
| 104 | IDT Meeting Notes | Blake | | 5-3-94 |
| 105 | 608/609 Road Meeting Notes | Gerritsma | Files | 5-5-94 |
| 106 | Dwarf Mistletoe Input | Fairweather | Gerritsma | 5-9-94 |
| 107 | DM/Canopy Study | Gerritsma | | 5-31-94 |
| 108 | MSO Sustainability Discussion | Blake | IDT | 6-1-94 |
| 109 | Field Notes w/ ADG&F | Paul | Gerritsma | 6-3-94 |
| 110 | Brackenfern Memo | Wilson | Blake | 8-15-94 |
| 111 | 608 Road Closure Order | Trevey | | 8-18-94 |
| 112 | Timber Harvest Analysis | Gerritsma | | 8-31-94 |
| 113 | Analysis Status Letter | Greco | Publics | 9-12-94 |

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|---|---|---|---|---|
| 114 | Water Quality Input - ADEQ | Meyer | Greco | 9-26-94 |
| 115 | Notice of Intent | Greco | Fed. Register | 10-4-94 |
| 116 | Phone Documentation - Erman | Gerritsma | | 9-22-94 |
| 117 | IDT Partner w/ FWLS Letter | Spiller | Greco | 8-10-94 |
| 118 | Response to Mail List Inquiry | Various | | 9-28-94 |
| 119 | Brackenfern, Locust, Presettlement | Moniak | | 8-94 |
| 120 | Dwarf Mistletoe Input | Fairweather | | 10-6-94 |
| 121 | Input to EIS | Erman | Greco | 10-11-94 |
| 122 | Contacts for IDT Meeting | Gerritsma | Various | 10-12-94 |
| 123 | DM Effects on Canopies | Gerritsma | IDT | 10-14-94 |
| 124 | Reply to Field Trip | Moniak | IDT | 10-19-94 |
| 125 | Field Meeting Notes - Rd 608 | Gerritsma | File | 10-24-94 |
| 126 | IDT Meeting Notes | Gerritsma | File | 10-24-94 |
| 127 | Winter Recreation Input | Brill | File | 10-20-94 |
| 128 | MSO Habitat Designation | Whitney | IDT | 12-4-94 |
| 129 | Law Enforcement Input | Reamer | Steen | 12-7-94 |
| 130 | Burning Proposals | Gerritsma | File | 12-9-94 |
| 131 | Forage Improvement Burns | Fleishman | File | 12-9-94 |
| 132 | TES/VSS Forage Predictions | Fleishman | File | 12-9-94 |
| 133 | Winter Sports Input | Gerritsma | File | 12-9-94 |
| 134 | IDT Meeting Notes at FWLS | Blake | File | 1-4-95 |
| 135 | Historical Insect/Disease Input | Wilson | File | 2-9-95 |
| 136 | Quantitative MSO Analysis | Gerritsma | File | 3-5-95 |
| 137 | IDT Meeting Notes | Gerritsma | File | 3-9-95 |
| 138 | Effects to MSO | Gerritsma | File | 3-15-95 |
| 139 | Feasibility of Unevenage | Gerritsma | IDT | 3-21-95 |
| 140 | VSS Projections | Gerritsma | File | 4-5-95 |
| 141 | Unevenage Application | Gerritsma | File | 4-25-95 |
| 142 | Historical Input | Moniak | Gerritsma | 4-27-95 |
| 143 | Pheromone Baiting | Weiss | | 4-7-95 |
| 144 | (not used) | | | |
| 145 | FWLS Input | James | File | 5-10-95 |
| 146 | Economics Worksheet | | | 5-10-95 |
| 147 | Notice of Intent - Second Notice | | Federal Register | 5-10-95 |
| 148 | IDT Meeting Notes | Gerritsma | File | 5-17-95 |
| 149 | Photos - Pocket Point | McCadden | | |
| 150 | Determination of MSO Habitat | Gerritsma | File | 12-4-95 |
| 151 | Pocket-Baker Spreadsheets | | | |
| 152 | Mail List Request | Cameron | Gerritsma | 4-19-95 |
| 153 | IDT Notes | Gerritsma | File | 5-17-95 |

| | | | | |
|---|---|---|---|---|
| 154 | Notice of Availability | Greco | Federal Register | 6-2-95 |
| 155 | DEIS/ Transmittal Letter | Greco | Publics | 5-30-95 |
| 156 | Input to DEIS | | | |
| | Yavapai Indian Tribe | Euler | Greco | 6-6-95 |
| | Precision Pine & Timber | Smith | Greco | 6-13-95 |
| | USDI - BLM | Kast | Greco | 6-30-95 |
| | W.A. and Peggy Randall | Randall | Greco | 7-12-95 |
| | ADEQ | Jagow | Greco | 7-14-95 |
| | Arizona State Parks | Heslin | Greco | 7-15-95 |
| | Forest Conservation Council | Cameron | Greco | 7-17-95 |
| | USDI - FWS | Spiller | Greco | 7-24-95 |
| | Arizona Game & Fish | Goodwin | Greco | 7-27-95 |
| | Erman | Erman | Greco | 7-29-95 |
| | US EPA | Wieman | Greco | 7-31-95 |
| | USDI - Office of Secretary | Port | Greco | 8-10-95 |
| 157 | Input to DEIS - SWC Bio Div | Galvin | Greco | 6-13-95 |
| 158 | Clarification of Effects | Gerritsma | IDT | 6-11-95 |
| 159 | MSO/DM Clarification | Gerritsma | IDT | 6-19-95 |
| 160 | Request for DEIS - CSU | Schmidt | Greco | 6-30-95 |
| 161 | MSO/DM Presentation | Gerritsma | | 7-14-95 |
| 162 | Arizona State Parks | Grandrud | Greco | 7-13-95 |
| 163 | Pocket/Baker Field Review | Brill | File | 9-6-95 |
| 164 | Wildlife Habitat Assessment | Whitney | File | 3-96 |
| 165 | Wildlife BA&E | Whitney | File | 4-96 |
| 166 | Revised Spreadsheets | | | 4-96 |
| 167 | Project Record Index | | | 4-24-96 |
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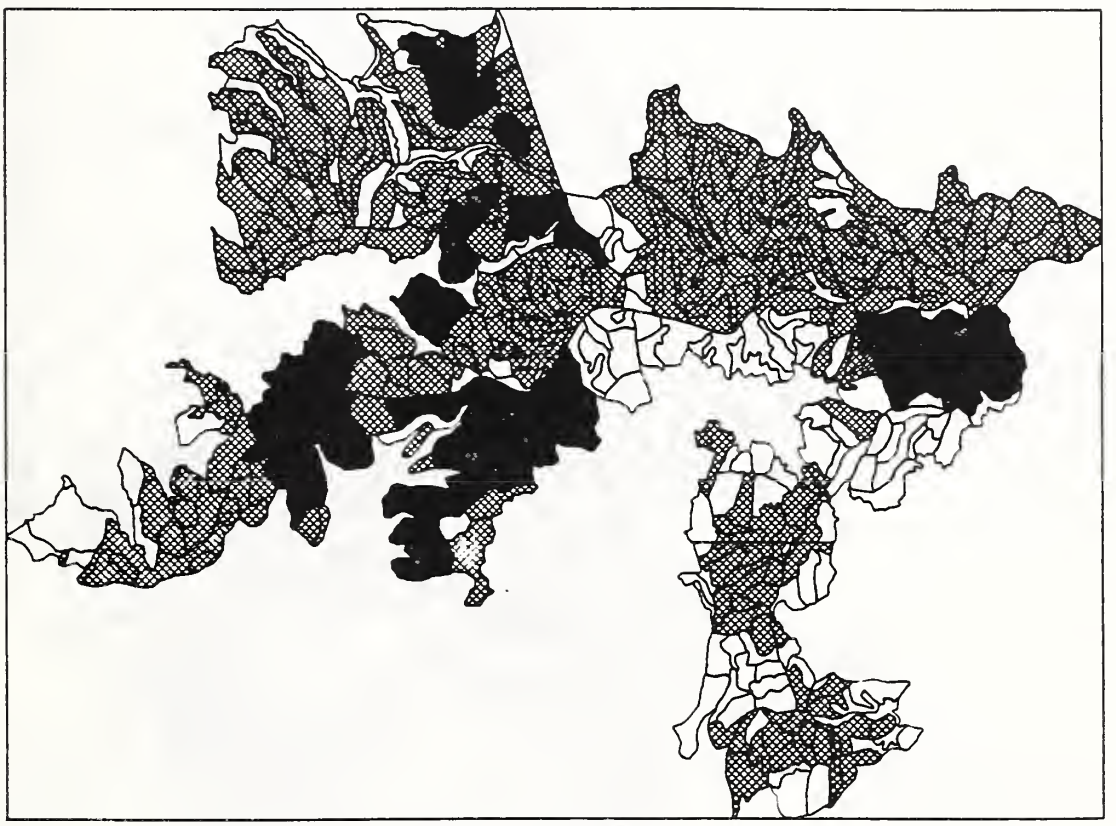
# POCKET/BAKER PRESCRIBED FIRE SITES



SCALE 1: 126720.
COCONINO NATIONAL FOREST
FLAGSTAFF, ARIZONA

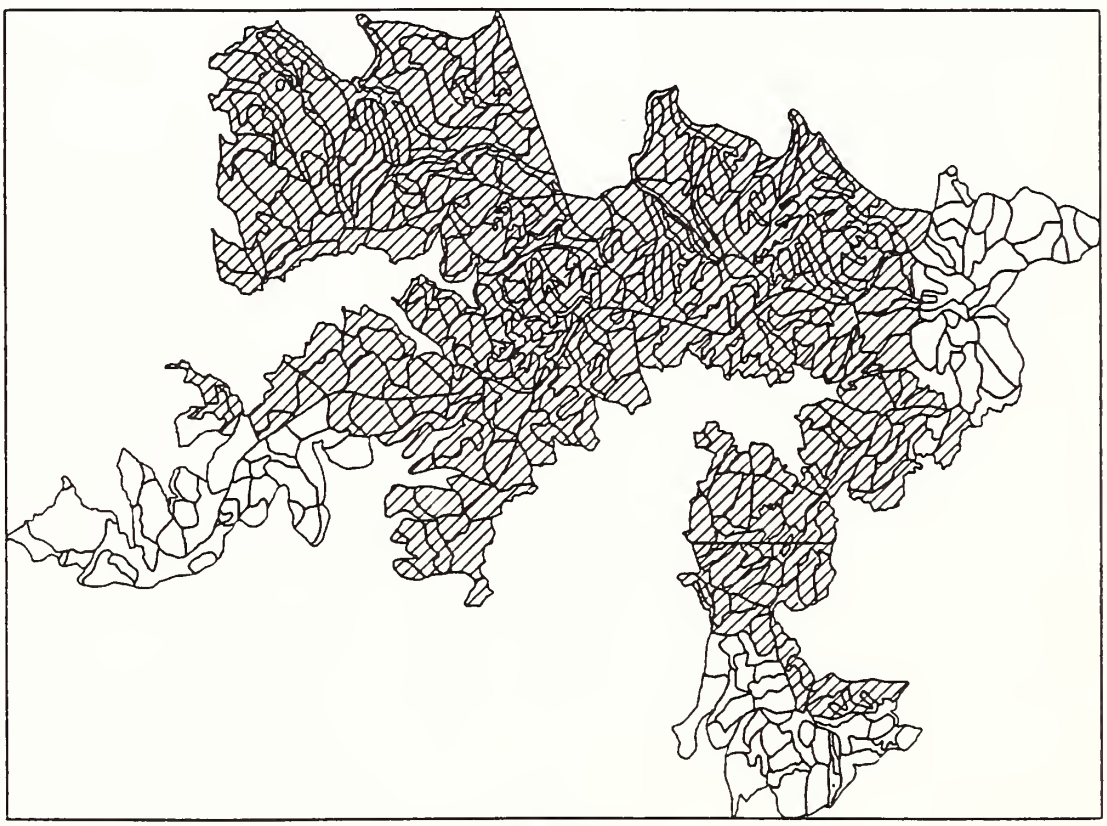
AUTOCAD

8/13/85 13:52:45

**LEGEND**

- HAZARD REDUCTION BURN
- FORAGE IMPROVEMENT BURN
- NO BROADCAST BURNING

# POCKET/BAKER MSO CRITICAL HABITAT



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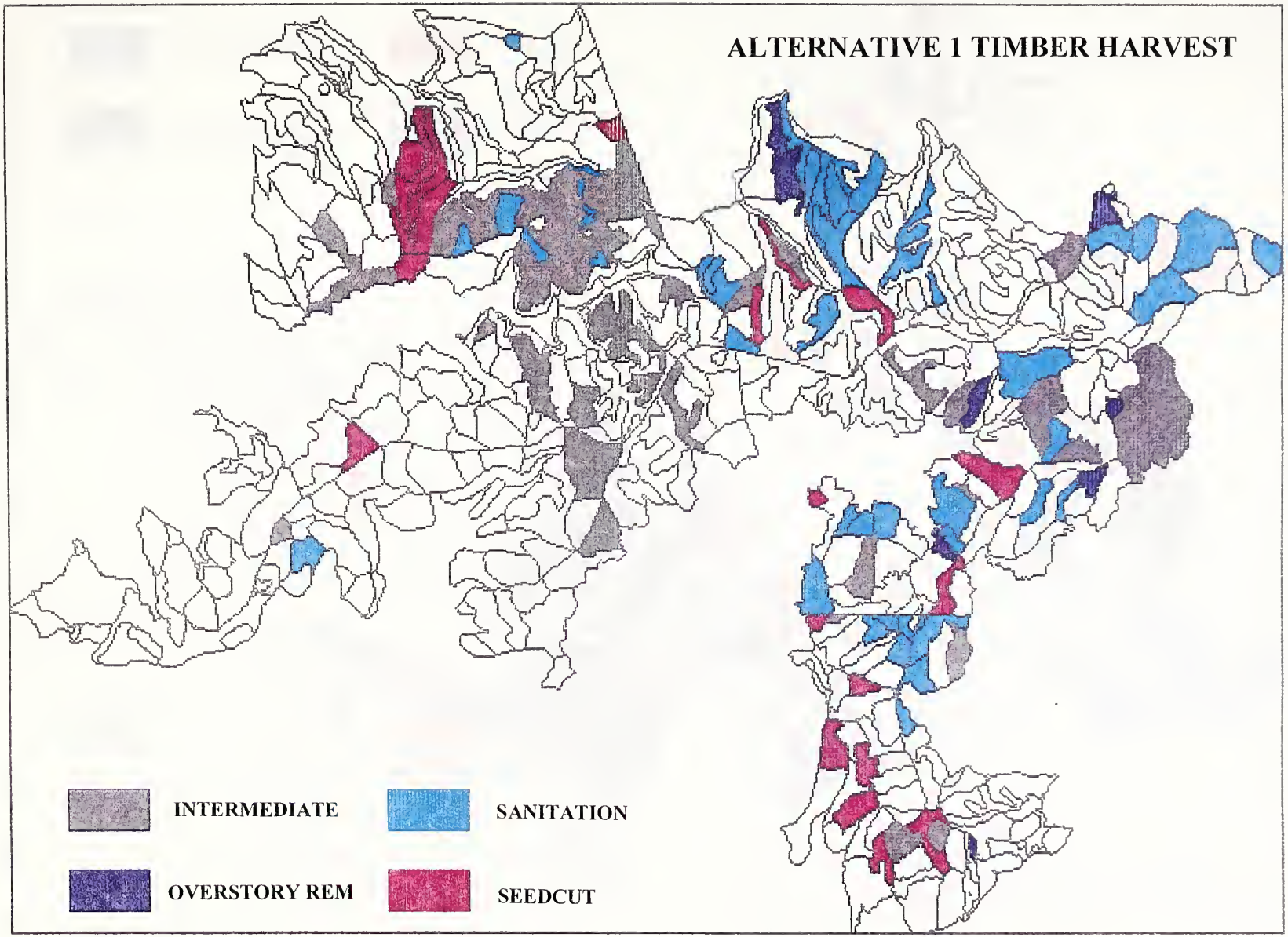
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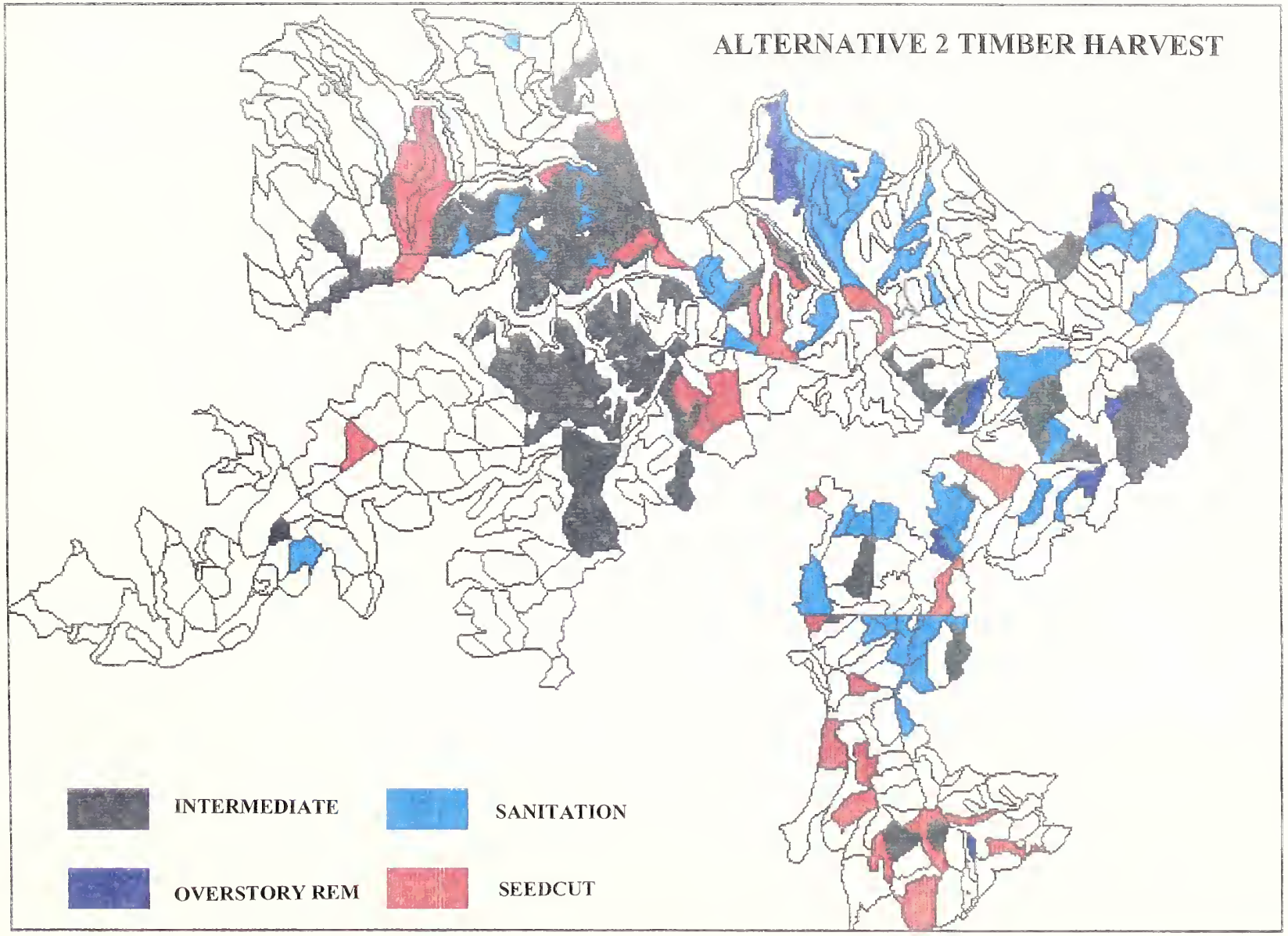
INTERMEDIATE
SANITATION
OVERSTORY REM
SEEDCUT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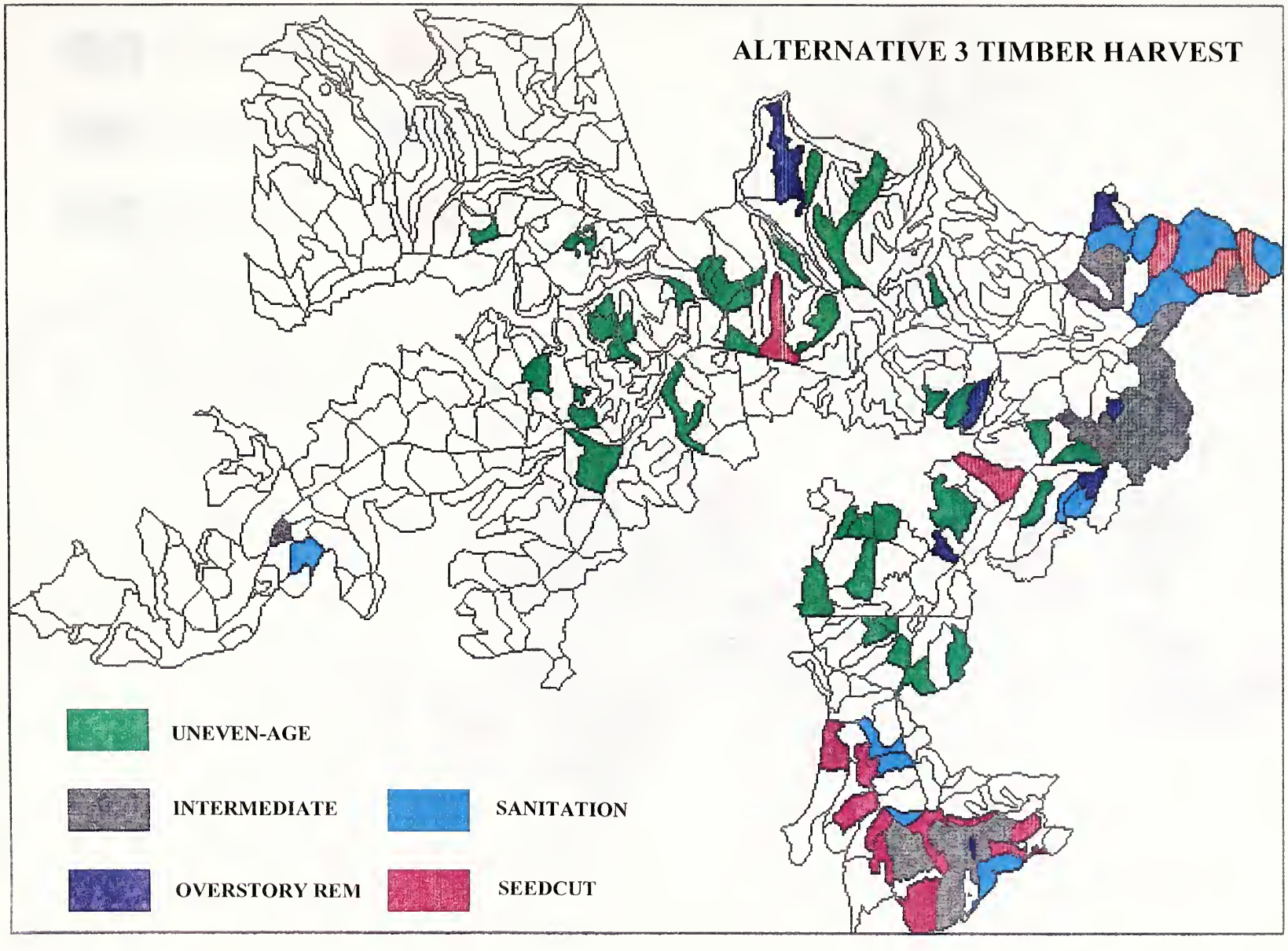
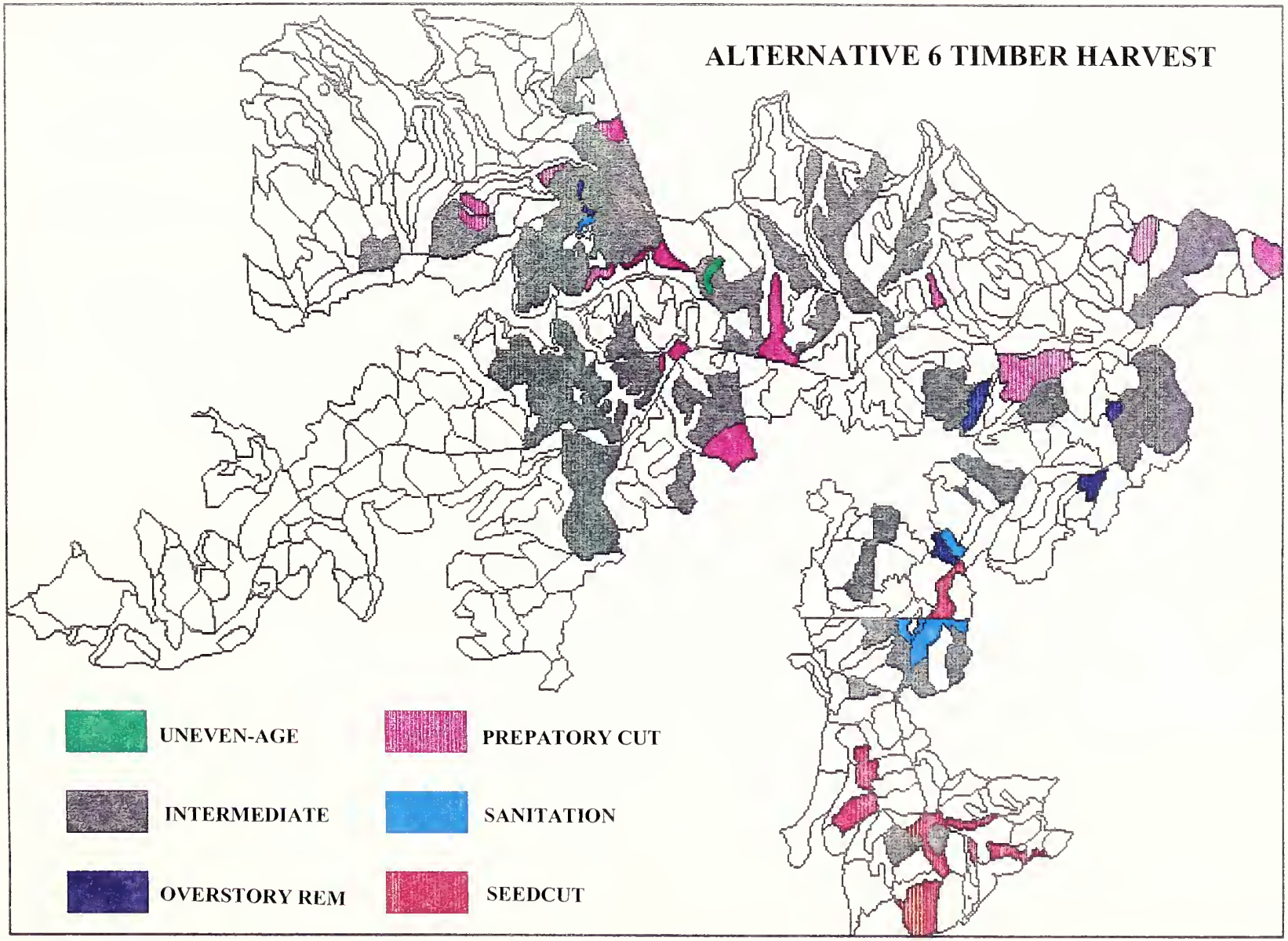
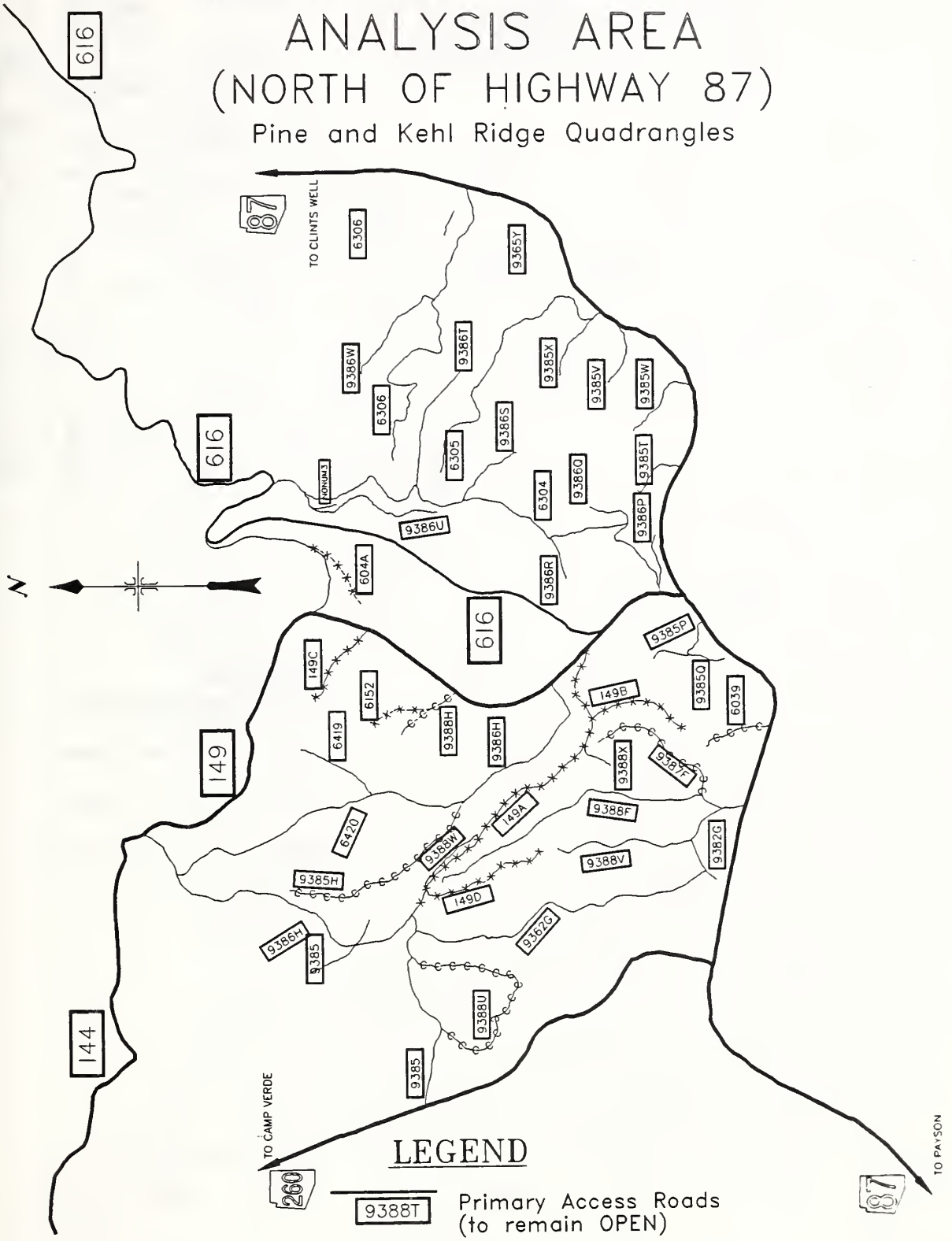
INTERMEDIATE
SANITATION
OVERSTORY REM
SEEDCUT


ALTERNATIVE 3 TIMBER HARVEST
UNEVEN-AGE
INTERMEDIATE
SANITATION
OVERSTORY REM
SEEDCUT


ALTERNATIVE 6 TIMBER HARVEST
UNEVEN-AGE
PREPATORY CUT
INTERMEDIATE
SANITATION
OVERSTORY REM
SEEDCUT

# BAKER 10,000 ACRE ANALYSIS AREA (NORTH OF HIGHWAY 87)

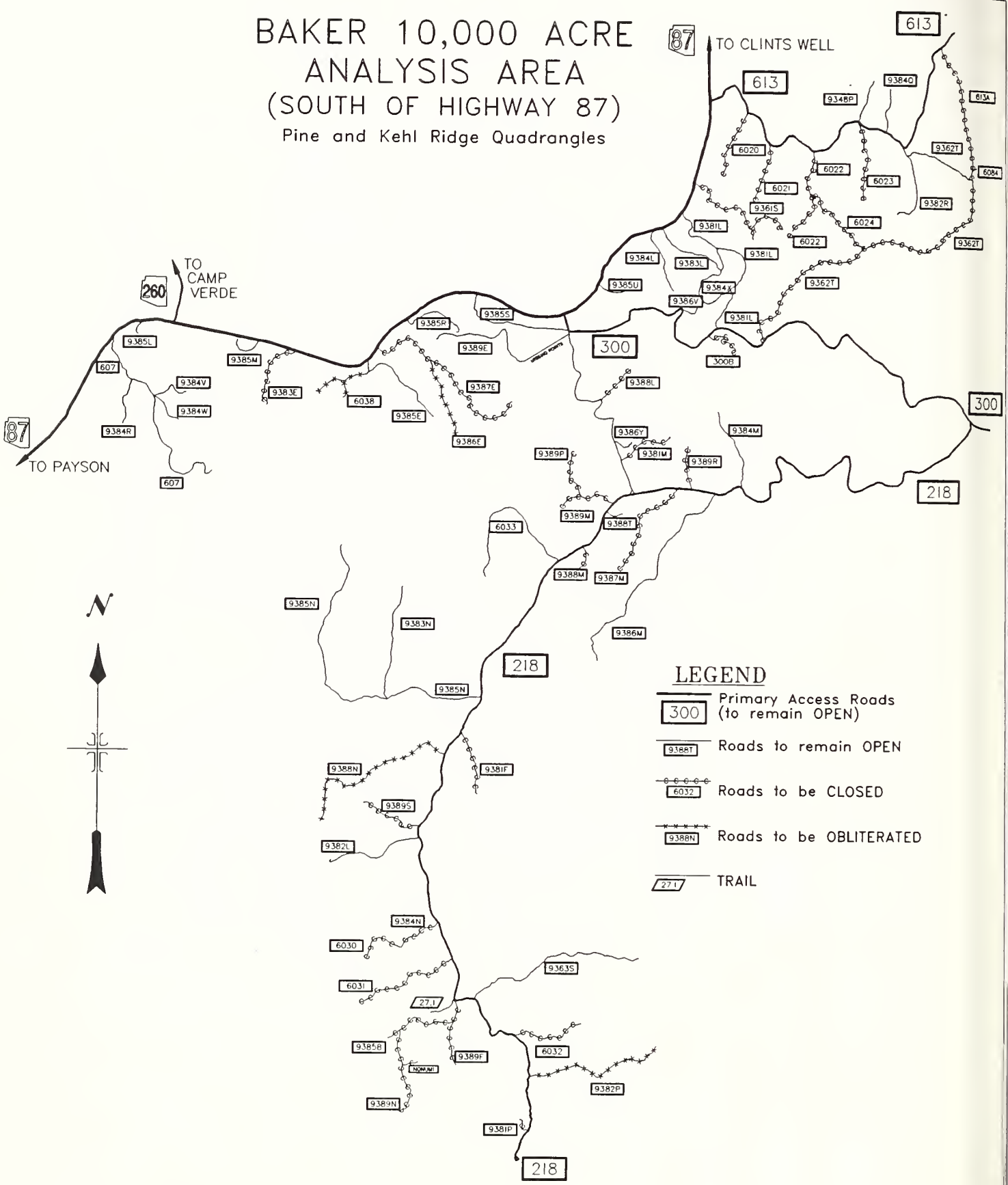
Pine and Kehl Ridge Quadrangles




## LEGEND

- 9388T — Primary Access Roads (to remain OPEN)
- 9388T — Roads to remain OPEN
- 6032 — Roads to be CLOSED
- 9388N — Roads to be OBLITERATED

# BAKER 10,000 ACRE ANALYSIS AREA
## (SOUTH OF HIGHWAY 87)
Pine and Kehl Ridge Quadrangles

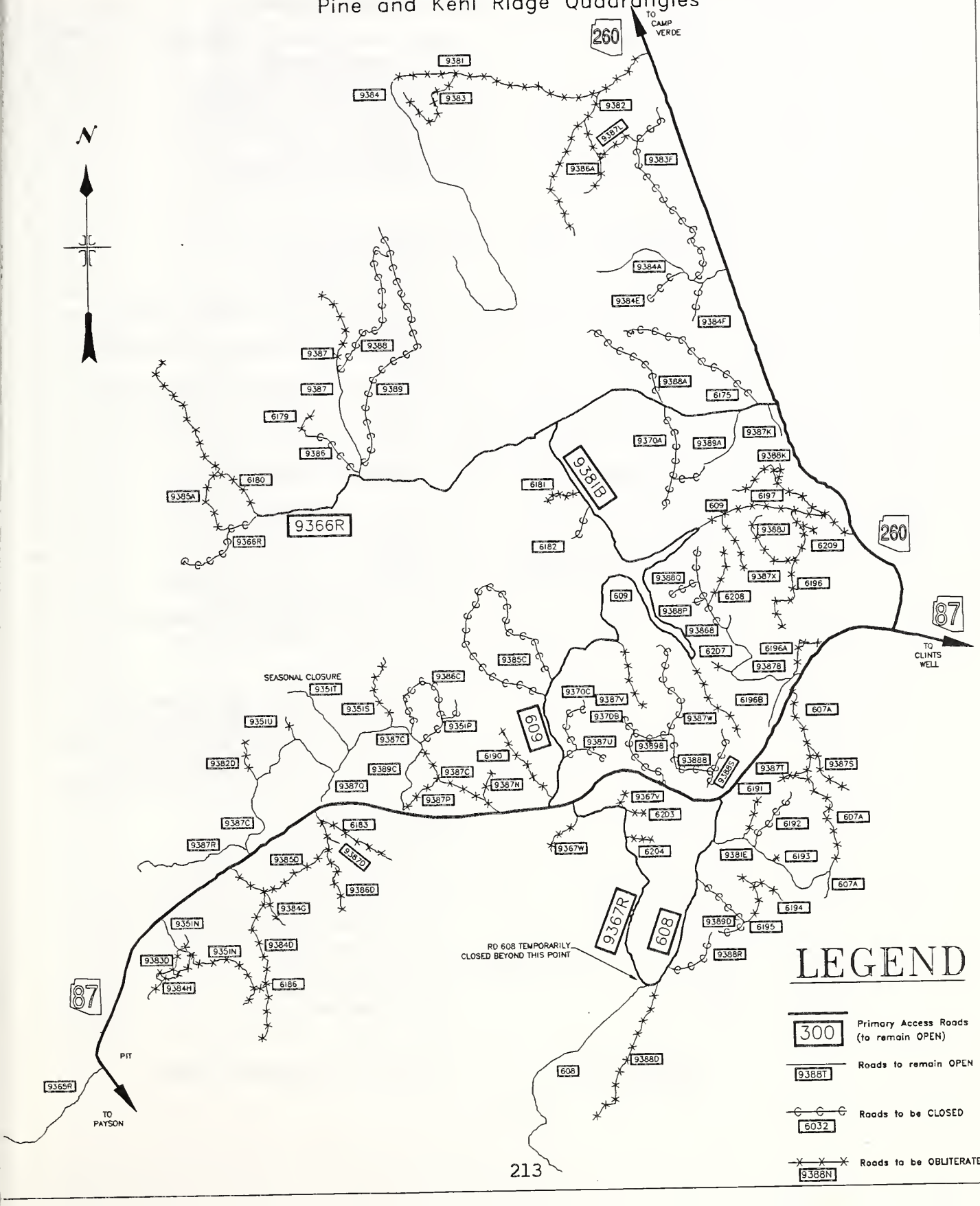



LEGEND

- 300 — Primary Access Roads (to remain OPEN)
- 9388T — Roads to remain OPEN
- 6032 — Roads to be CLOSED
- 9388N — Roads to be OBLITERATED
- 27.1 — TRAIL

# POCKET 10,000 ACRE ANALYSIS AREA

## Pine and Kehl Ridge Quadrangles



## APPENDIX E

## GLOSSARY
## FOR MANAGEMENT ACTIVITY DATABASE

| | | |
|---|---|---|
| **AC** | Acres | Acres from GIS stand map. |
| **ALT(#)** | Alternative (#) | Harvest treatment for each alternative:<br>4135=group shelterwood<br>4143=final removal (overstory)<br>4151=unevenage (individual tree)<br>4220=intermediate (thin from below)<br>4121=preparatory cut<br>4230=sanitation (individual tree)<br>4240=special (aspen restoration) |
| **BURN** | Prescribed Fire Treatment | RX??=forage improvement burn:<br>RXLP=low priority<br>RXMP=moderate priority<br>RXHP=high priority<br>HAZD=hazard (high fuel loading) reduction broadcast burn.<br>CRUSH=mechanical crushing of old machine piles.<br>BD=burning machine piles from previous sales. |
| **CHU** | Critical Habitat Unit | Mexican spotted owl CHU number (last digit). |
| **DMR** | Dwarf Mistletoe Rating | L=Low, M=Moderate, H=High |
| **LOCSITE** | Location/Site | Compartment number and stand number. |
| **MSORP** | Habitat Type as Defined in the MSO Recovery Plan | **Protected:**<br>WITH = withdrawn lands (wilderness)<br>PAC = protected activity center<br>MC40 = mixed conifer (slopes over 39%)<br>PO40 = pine oak (slopes over 39%)<br><br>**Restricted:**<br>MCTH = mixed conifer (threshold conditions)<br>POTH = pine-oak (threshold conditions)<br>MCPT = mixed conifer (potential to meet MCTH)<br>POPT = pine-oak (potential to meet POTH)<br>PONP = pine-oak (no potential for meeting POTH)<br><br>**Other Forest Types:**<br>PP = ponderosa pine (not pine-oak)<br>PJ = pinyon-juniper<br>OTH = other vegetation types not PP or PJ |
| **VEG** | Vegetation Type | As defined in RMRIS (Oracle Database)<br>PO = Pine Oak (not defined in RMRIS)<br>PP = Ponderosa Pine<br>MC = Mixed Conifer<br>PJ = Pinyon-Juniper<br>GRA = Grassland<br>BA = Barren |
| **VSS** | Vegetative Stand Structure | See page 34 for explanation of symbols. |

BAKER 10K MANAGEMENT ACTIVITY DATABASE 30-May-96

| LOC/SITE | AC | VEG | VSS | DMR | ALT1 | ALT2 | ALT3 | ALT6 | BURN | CHU | MSORP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6720001 | 98 | PO | 3A | M | | | | | BD | 2 | POPT |
| 6720002 | 54 | PP | 3A | 0 | | | | | BD | 2 | PP |
| 6720003 | 106 | PO | 4B | M | | | | | RXHP | 2 | POPT |
| 6720004 | 92 | PP | 4A | 0 | | | | | RXHP | 2 | PP |
| 6720005 | 33 | PP | 3A | H | 4135 | 4135 | | 4220 | RXHP | 2 | PP |
| 6720006 | 27 | PO | 3A | L | 4220 | 4220 | 4151 | 4220 | RXHP | 2 | POPT |
| 6720007 | 19 | PP | 4A | 0 | | | | 4220 | RXHP | 2 | PP |
| 6720008 | 61 | PO | 4B | H | 4135 | 4135 | | 4220 | RXHP | 2 | POPT |
| 6720009 | 45 | PO | 3A | 0 | | | | | RXHP | 2 | POPT |
| 6720010 | 100 | PP | 4A | L | | | | | RXHP | 2 | PP |
| 6720011 | 51 | PO | 3A | L | 4230 | 4230 | 4151 | 4220 | RXHP | 2 | POPT |
| 6720012 | 60 | PO | 4A | M | | | | | RXHP | 2 | POPT |
| 6720013 | 62 | PP | 3A | M | | | | | RXHP | 2 | PP |
| 6720014 | 77 | PO | 4A | H | | 4135 | 4135 | 4121 | RXHP | 2 | POPT |
| 6720015 | 28 | PO | 3B | L | 4230 | 4230 | 4151 | 4220 | | 2 | POPT |
| 6720016 | 32 | PO | 3A | H | 4135 | 4135 | | 4220 | RXHP | 2 | POPT |
| 6720017 | 29 | PP | 3A | M | | | | | | 2 | PP |
| 6720018 | 20 | PO | 3A | L | 4220 | 4220 | 4151 | 4220 | RXHP | 2 | POPT |
| 6720019 | 16 | PP | 3A | L | 4220 | 4220 | 4151 | 4220 | RXHP | 2 | PP |
| 6720020 | 64 | PO | 4B | L | 4230 | 4230 | 4151 | 4220 | BD | 2 | POPT |
| 6720021 | 19 | PO | 3A | L | 4230 | 4230 | 4151 | | BD | 2 | POPT |
| 6730001 | 112 | PO | 3A | L | 4143 | 4143 | 4143 | 4152 | RXHP | 2 | POPT |
| 6730002 | 91 | PP | 3A | 0 | | | | | RXHP | 2 | PP |
| 6730003 | 32 | PP | 3A | L | 4230 | 4230 | 4151 | 4220 | RXHP | 2 | PP |
| 6730004 | 76 | PO | 3A | 0 | | | | | RXHP | 2 | POPT |
| 6730005 | 61 | PP | 4B | L | 4230 | 4230 | 4151 | 4220 | RXHP | 2 | PP |
| 6730006 | 37 | PP | 4A | M | | | | | RXHP | 2 | PP |
| 6730007 | 49 | PP | 4A | M | | | | | RXHP | 2 | PP |
| 6730008 | 96 | PO | 4A | M | | | | | RXHP | 2 | POPT |
| 6730009 | 4 | PP | 4C | L | | | | | RXHP | 2 | PP |
| 6730010 | 45 | PP | 3B | L | | | | | RXHP | 2 | PP |
| 6730011 | 37 | PP | 3A | L | | | | | RXHP | 2 | PP |
| 6730012 | 31 | PP | 3A | M | | | | | RXHP | 2 | PP |
| 6730013 | 10 | PP | 4C | L | | | | | RXHP | 2 | PP |
| 6730014 | 89 | PO | 3A | L | 4230 | 4230 | 4151 | 4220 | RXHP | 2 | POPT |
| 6730015 | 83 | PO | 4A | H | | | | | RXHP | 2 | POPT |
| 6730016 | 54 | PP | 3B | L | | | | | RXHP | 2 | PP |
| 6730017 | 48 | PP | 4A | L | 4230 | 4230 | | 4220 | RXHP | 2 | PP |
| 6730018 | 122 | PP | 3A | L | 4230 | 4230 | | | RXHP | 2 | PP |
| 6730019 | 43 | PP | 4A | L | | | | | RXHP | 2 | PP |
| 6740001 | 98 | PP | 4A | L | 4230 | 4230 | | 4220 | RXHP | 2 | PP |
| 6740002 | 198 | MC | 4B | L | | | | | RXHP | 2 | PAC |
| 6740003 | 43 | PP | 4B | M | | | | | BD | 2 | PP |
| 6740004 | 17 | PO | 3A | L | 4230 | 4230 | 4151 | 4121 | RXHP | 2 | POPT |
| 6740005 | 85 | MC | 4B | L | | | | | RXHP | 2 | MC40 |
| 6740006 | 27 | PO | 4C | L | | | | | RXHP | 2 | PO40 |
| 6740007 | 14 | PO | 3B | H | | | | | BD | 2 | POPT |

BAKER 10K MANAGEMENT ACTIVITY DATABASE 30-May-96

| LOC/SITE | AC | VEG | VSS | DMR | ALT1 | ALT2 | ALT3 | ALT6 | BURN | CHU | MSORP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6740008 | 46 | PO | 3B | M | | | | | RXHP | 2 | POPT |
| 6740009 | 31 | PO | 4B | L | | | | | | 2 | POPT |
| 6740010 | 57 | PP | 4A | L | 4220 | 4220 | | 4121 | RXHP | 2 | PP |
| 6740011 | 17 | MC | 4B | M | | | | | RXHP | 2 | MCPT |
| 6740012 | 15 | PP | 5B | L | | | | | RXHP | 2 | PP |
| 6740013 | 20 | PP | 6B | H | | | | | RXHP | 2 | PP |
| 6740014 | 25 | MC | 6C | L | | | | | RXHP | 2 | MCPT |
| 6740015 | 11 | PP | 6B | L | | | | | RXHP | 2 | PP |
| 6740016 | 68 | PP | 4A | M | | | | | BD | 2 | PP |
| 6740017 | 72 | PO | 4B | M | | | | | RXHP | 2 | POPT |
| 6740018 | 41 | PP | 3B | M | | | | | RXHP | 2 | PP |
| 6740019 | 21 | PP | 5A | L | | | | | RXHP | 2 | PP |
| 6740020 | 23 | PO | 4A | M | | | | | RXHP | 2 | POPT |
| 6740021 | 26 | PP | 3C | M | | | | | RXHP | 2 | PP |
| 6740022 | 15 | MC | 4B | M | | | | | RXHP | 2 | MCPT |
| 6740023 | 31 | MC | 4C | L | | | | | RXHP | 2 | MC40 |
| 6740024 | 32 | PO | 4A | M | | | | | RXHP | 2 | POPT |
| 6740025 | 12 | MC | 4A | M | | | | | RXHP | 2 | MCPT |
| 6740026 | 26 | PP | 4B | M | | | | | BD | 2 | PP |
| 6740027 | 47 | MC | 4B | M | | | | | RXHP | 2 | MCPT |
| 6740028 | 45 | MC | 5C | L | | | | | RXHP | 2 | MC40 |
| 6860001 | 54 | PO | 4B | M | | | | | RXHP | 2 | POPT |
| 6860002 | 22 | PP | 4B | M | | | | | RXHP | 2 | PP |
| 6860003 | 41 | PO | 4A | M | 4143 | 4143 | 4143 | 4143 | CRUSH | 2 | POPT |
| 6860004 | 39 | PO | 3A | L | 4220 | 4220 | 4151 | 4220 | RXHP | 2 | POPT |
| 6860005 | 58 | PO | 3B | M | | | | 4220 | CRUSH | 2 | POPT |
| 6860006 | 21 | PP | 3C | 0 | | | | | RXHP | 2 | PP |
| 6860007 | 86 | PO | 3B | M | | | | | RXHP | 2 | POPT |
| 6860008 | 20 | PO | 3A | L | 4220 | 4220 | 4151 | 4220 | | 2 | POPT |
| 6860009 | 44 | PP | 4A | L | 4220 | 4220 | | | | 2 | PP |
| 6860010 | 50 | PP | 3A | 0 | | | | | | 2 | PP |
| 6860011 | 87 | PO | 3B | M | | | | | CRUSH | 2 | POPT |
| 6860012 | 68 | PP | 4B | H | | | | | | 2 | PP |
| 6860013 | 63 | PP | 3B | H | | | | | CRUSH | 2 | PP |
| 6860014 | 28 | PP | 4C | M | | | | | | 2 | PP |
| 6860015 | 101 | PO | 4B | H | | | | | CRUSH | 2 | POPT |
| 6860016 | 48 | PP | 4B | M | | | | | | 2 | PP |
| 6860017 | 41 | PO | 3B | H | | | | | | 2 | POPT |
| 6860019 | 90 | PP | 3B | H | | 4135 | | 4220 | | 2 | PP |
| 6860020 | 50 | PO | 3B | L | | | | | | 2 | POPT |
| 6860021 | 8 | BA | 0 | 0 | | | | | | 2 | OTH |
| 6860023 | 29 | PO | 3B | L | | | | | | 2 | POPT |
| 6860024 | 78 | PO | 3B | L | | | | 4121 | | 2 | POPT |
| 6860025 | 72 | PO | 3A | H | | 4135 | | 4220 | BD | 2 | POPT |
| 6860026 | 65 | PO | 3B | L | 4220 | 4220 | 4220 | | | 2 | POPT |
| 6860027 | 33 | PO | 4A | H | | | | | | 2 | POPT |
| 6870001 | 66 | PO | 6B | M | | | | | RXHP | 2 | POPT |

BAKER 10K MANAGEMENT ACTIVITY DATABASE 30-May-96

| LOC/SITE | AC | VEG | VSS | DMR | ALT1 | ALT2 | ALT3 | ALT6 | BURN | CHU | MSORP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6870002 | 61 | PO | 4B | M | | | | | RXHP | 2 | POPT |
| 6870003 | 23 | PO | 4B | L | | | | | RXHP | 2 | POPT |
| 6870004 | 46 | MC | 4B | M | | | | | RXHP | 0 | MCPT |
| 6870005 | 85 | MC | 5C | M | 4240 | 4240 | 4240 | | RXHP | 0 | MCTH |
| 6870006 | 34 | MC | 5C | L | | | | | | 0 | MCPT |
| 6870007 | 21 | MC | 5A | 0 | | | | | RXHP | 0 | MCPT |
| 6870008 | 56 | PO | 4B | M | 4240 | 4240 | 4220 | | RXHP | 0 | POTH |
| 6870009 | 103 | PO | 4A | L | 4230 | 4230 | 4230 | 4220 | RXHP | 0 | POPT |
| 6870010 | 59 | MC | 4B | M | 4240 | 4240 | 4240 | | RXHP | 0 | MCPT |
| 6870011 | 42 | PO | 4B | 0 | | | 4220 | | RXHP | 0 | POPT |
| 6870012 | 24 | MC | 4B | L | | | | | RXHP | 0 | MCPT |
| 6870013 | 42 | PO | 4A | L | | | 4220 | | RXHP | 0 | POPT |
| 6870014 | 34 | MC | 4B | L | 4240 | 4240 | 4220 | | RXHP | 0 | MCPT |
| 6870015 | 54 | PO | 4B | L | 4230 | 4230 | 4230 | | RXHP | 0 | POPT |
| 6870016 | 48 | PO | 4A | L | 4230 | 4230 | 4230 | 4121 | RXHP | 0 | POPT |
| 6870017 | 60 | PO | 4B | H | | | 4135 | | RXHP | 0 | POTH |
| 6870018 | 139 | PO | 4B | L | 4230 | 4230 | 4230 | 4220 | RXHP | 0 | POPT |
| 6870019 | 75 | PO | 4A | M | | | 4135 | | RXHP | 0 | POPT |
| 6870020 | 23 | PO | 3B | M | | | 4220 | | RXHP | 0 | POPT |
| 6870021 | 61 | PO | 4A | M | | | 4135 | | RXHP | 0 | POPT |
| 6870022 | 17 | PP | 2A | 0 | | | | | RXHP | 0 | PP |
| 6870023 | 5 | PO | 2A | 0 | | | | | RXHP | 0 | POPT |
| 6870024 | 7 | PP | 5C | L | | | | | RXHP | 0 | PP |
| 6870025 | 47 | PO | 3A | L | 4230 | 4230 | 4230 | 4121 | RXHP | 0 | POPT |
| 6870026 | 40 | PO | 2A | L | 4143 | 4143 | 4143 | | RXHP | 0 | POPT |
| 6930001 | 34 | PO | 4B | H | | | | | RXHP | 2 | POPT |
| 6930002 | 8 | PO | 4B | H | | | | | RXHP | 2 | POPT |
| 6930003 | 103 | PO | 3A | M | | | | | CRUSH | 2 | POPT |
| 6930004 | 84 | PO | 3A | H | 4135 | 4135 | 4135 | 4220 | RXHP | 2 | POPT |
| 6930005 | 32 | PP | 3A | M | | | | | BD | 2 | POPT |
| 6930006 | 23 | PP | 1 | L | 4143 | 4143 | 4143 | 4143 | RXHP | 2 | PP |
| 6930007 | 45 | PP | 3B | M | | | | | CRUSH | 2 | PP |
| 6930008 | 46 | PP | 4A | H | 4135 | 4135 | | 4131 | RXHP | 2 | PP |
| 6930009 | 71 | PP | 3A | M | | | | | RXHP | 2 | PP |
| 6930010 | 69 | PP | 3A | M | | | | | BD | 2 | PP |
| 6930011 | 3 | GRA | 0 | 0 | | | | | | 2 | OTH |
| 6930012 | 34 | PO | 3B | H | | | | | RXHP | 2 | POPT |
| 6930013 | 58 | PP | 2A | M | | | | | RXHP | 2 | PP |
| 6930014 | 78 | PP | 3A | M | | | | | BD | 2 | PP |
| 6930015 | 75 | PP | 3A | L | 4230 | 4230 | 4151 | | CRUSH | 2 | PP |
| 6930016 | 45 | PP | 3A | L | 4230 | 4230 | 4151 | 4220 | CRUSH | 2 | PP |
| 6930017 | 71 | PP | 3B | H | | | | | RXHP | 2 | PP |
| 6930018 | 39 | PP | 3A | M | | | | | CRUSH | 2 | PP |
| 6930019 | 26 | PP | 4B | 0 | | | | | RXHP | 2 | PP |
| 6930020 | 26 | PP | 3B | M | | | | | RXHP | 2 | PP |
| 6930021 | 62 | PP | 3B | L | 4220 | 4220 | 4151 | 4220 | RXHP | 2 | PP |
| 6930022 | 13 | PP | 4B | H | 4135 | 4135 | | | RXHP | 2 | PP |

BAKER 10K MANAGEMENT ACTIVITY DATABASE 30-May-96

| LOC/SITE | AC | VEG | VSS | DMR | ALT1 | ALT2 | ALT3 | ALT6 | BURN | CHU | MSORP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6930023 | 20 | PP | 3A | L | 4230 | 4230 | 4151 | | CRUSH | 2 | PP |
| 6930024 | 26 | PP | 3A | L | 4230 | 4230 | 4151 | | CRUSH | 2 | PP |
| 6930025 | 37 | PP | 3A | M | | | | | CRUSH | 2 | PP |
| 6930026 | 18 | PP | 4B | L | 4230 | 4230 | | 4230 | RXHP | 2 | PP |
| 6930027 | 88 | PP | 3A | L | 4230 | 4230 | 4151 | | CRUSH | 2 | PP |
| 6930028 | 24 | PP | 3B | M | | | | | BD | 2 | PP |
| 6930029 | 10 | PO | 4B | L | 4220 | 4220 | | 4220 | BD | 2 | POPT |
| 6930030 | 34 | MC | 5C | M | | | | | RXHP | 2 | MC40 |
| 6940001 | 47 | PO | 4C | L | | | | | HAZD | 0 | POPT |
| 6940002 | 14 | PO | 4B | L | | | | | HAZD | 0 | POPT |
| 6940003 | 23 | PO | 4C | L | | | | | | 2 | POPT |
| 6940004 | 123 | PO | 4B | L | 4230 | 4230 | 4240 | 4121 | HAZD | 2 | POPT |
| 6940005 | 88 | PO | 4C | L | | | | | HAZD | 0 | POPT |
| 6940006 | 129 | PO | 4A | L | 4220 | 4220 | 4220 | 4220 | HAZD | 0 | POPT |
| 6940007 | 86 | PO | 3A | L | 4220 | 4220 | 4220 | 4220 | HAZD | 0 | POPT |
| 6940008 | 68 | PO | 3A | L | 4220 | 4220 | 4220 | 4220 | HAZD | 0 | POPT |
| 6940009 | 89 | PO | 4A | M | 4240 | 4240 | 4220 | | HAZD | 0 | POPT |
| 6940010 | 38 | PO | 4A | L | 4230 | 4230 | | | HAZD | 2 | POPT |
| 6940011 | 76 | PO | 4A | L | 4220 | 4220 | 4240 | 4220 | HAZD | 2 | POPT |
| 6940012 | 57 | PO | 4B | L | 4220 | 4220 | 4220 | | | 0 | POPT |
| 6940013 | 79 | PO | 3A | M | | | | | | 2 | POPT |
| 6940014 | 81 | PP | 3A | M | | | | | | 2 | PP |
| 6940015 | 61 | PP | 3A | M | | | | | | 2 | PP |
| 6940016 | 49 | PP | 3A | M | | | | | | 2 | PP |
| 6940017 | 89 | PP | 3A | M | | | | | CRUSH | 2 | PP |
| 6940018 | 42 | PO | 3A | M | | | | | | 2 | POPT |
| 6940019 | 41 | PO | 3B | L | | | | | | 2 | POPT |
| 6940020 | 29 | PO | 3A | M | 4143 | 4143 | 4143 | 4143 | | 0 | POPT |
| 6940021 | 15 | PO | 3A | M | 4143 | 4143 | 4143 | 4143 | HAZD | 0 | POPT |
| 6940022 | 35 | PO | 4C | M | | | | | HAZD | 0 | POPT |
| 6940023 | 34 | PP | 4A | L | 4230 | 4230 | 4151 | | | 2 | PP |
| 6940024 | 18 | PO | 4A | L | 4230 | 4230 | 4230 | | | 0 | POPT |
| 6940025 | 32 | PO | 3A | M | | | 4230 | | | 0 | POPT |
| 6940026 | 21 | PO | 4B | L | 4220 | 4220 | 4220 | 4220 | HAZD | 0 | POPT |
| 6940027 | 31 | PO | 4B | L | 4220 | 4220 | 4151 | | HAZD | 2 | POPT |
| 6940028 | 38 | PO | 4B | L | 4220 | 4220 | 4151 | | | 2 | POPT |
| 6990001 | 15 | PO | 3B | L | | | | | CRUSH | 2 | POPT |
| 6990002 | 6 | PO | 3B | L | 4220 | 4220 | | | RXHP | 2 | POPT |
| 6990003 | 28 | PO | 3A | M | | | | | RXHP | 2 | POPT |
| 6990004 | 58 | PO | 3A | M | | | | | RXHP | 2 | POPT |
| 6990005 | 24 | PO | 3B | L | 4230 | 4230 | 4151 | 4220 | RXHP | 2 | POPT |
| 6990006 | 30 | PO | 3C | L | | | | | RXHP | 2 | POPT |
| 6990007 | 15 | PO | 3A | L | 4230 | 4230 | 4151 | 4220 | RXHP | 2 | POPT |
| 6990008 | 38 | PO | 3B | M | | | | | RXHP | 2 | POPT |
| 6990009 | 29 | PP | 3A | L | 4230 | 4230 | 4151 | 4220 | RXHP | 2 | PP |
| 6990010 | 19 | PP | 4A | L | 4230 | 4230 | | 4230 | RXHP | 2 | PP |
| 6990011 | 5 | GRA | 0 | 0 | | | | | | 2 | OTH |

BAKER 10K MANAGEMENT ACTIVITY DATABASE 30-May-96

| LOC/SITE | AC | VEG | VSS | DMR | ALT1 | ALT2 | ALT3 | ALT6 | BURN | CHU | MSORP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6990012 | 58 | PP | 4A | L | 4230 | 4230 | | 4230 | RXHP | 2 | PP |
| 6990013 | 59 | PO | 4B | M | | | | | CRUSH | 2 | POPT |
| 6990014 | 47 | PO | 4B | L | 4220 | 4220 | 4151 | 4220 | CRUSH | 2 | POPT |
| 6990015 | 42 | PP | 3B | L | 4230 | 4230 | 4151 | 4220 | CRUSH | 2 | PP |
| 6990016 | 42 | PP | 3A | M | | | | | RXHP | 2 | PP |
| 6990017 | 62 | PO | 3A | M | | | | | RXHP | 2 | POPT |
| 6990018 | 23 | PO | 3B | L | | | | 4220 | RXHP | 2 | POPT |
| 6990019 | 34 | PO | 3B | M | | | | | RXHP | 2 | POPT |
| 6990020 | 15 | PP | 4A | M | | | | | CRUSH | 2 | PP |
| 6990021 | 26 | PO | 3B | L | | | | | CRUSH | 2 | POPT |
| 6990022 | 14 | PO | 3B | L | | | | | CRUSH | 2 | PO40 |
| 6990023 | 39 | PO | 3A | M | | | 4230 | | BD | 0 | POPT |
| 6990024 | 54 | PO | 3A | M | | | | | RXHP | 2 | POPT |
| 6990025 | 21 | PO | 4A | L | 4230 | 4230 | | | RXHP | 2 | POPT |
| 6990026 | 27 | PO | 3B | M | | | | | | 2 | POPT |
| 6990027 | 30 | PO | 3A | H | | | | | | 2 | POPT |
| 6990028 | 32 | PO | 3A | H | | | | | | 0 | POPT |
| 6990029 | 58 | PO | 3A | H | 4135 | 4135 | 4135 | | CRUSH | 0 | POPT |
| 6990030 | 114 | PO | 3C | M | | | | | | 0 | POPT |
| 6990031 | 39 | PO | 6B | M | | | | | | 0 | PO40 |
| 6990032 | 40 | PO | 3A | H | 4135 | 4135 | 4135 | 4131 | BD | 0 | POPT |
| 6990033 | 30 | PP | 4A | M | | | 4230 | | BD | 0 | PP |
| 6990034 | 41 | PO | 4A | M | | | | | BD | 0 | POPT |
| 6990035 | 40 | PP | 3A | M | | | | | RXHP | 2 | PP |
| 6990036 | 54 | PO | 3A | M | | | | | BD | 0 | POPT |
| 6990037 | 51 | PO | 3B | H | 4135 | 4135 | 4135 | 4131 | BD | 0 | POPT |
| 6990038 | 39 | PO | 4C | L | | | | | RXHP | 0 | POPT |
| 7000001 | 106 | PO | 3C | L | | | | | RXHP | 0 | POPT |
| 7000002 | 36 | PO | 3A | H | 4135 | 4135 | 4135 | | RXHP | 0 | POPT |
| 7000003 | 48 | PO | 4B | L | 4220 | 4220 | 4220 | 4220 | RXHP | 0 | POPT |
| 7000004 | 90 | PO | 3A | H | | 4135 | 4135 | 4131 | CRUSH | 0 | POPT |
| 7000005 | 50 | PO | 4B | 0 | | | | | | 0 | POPT |
| 7000006 | 24 | PO | 5C | L | | | | | RXHP | 0 | POPT |
| 7000007 | 38 | PO | 4B | H | | | | | RXHP | 0 | POPT |
| 7000008 | 30 | PO | 3B | H | | | 4135 | | | 0 | POPT |
| 7000009 | 19 | PO | 3A | M | | | 4230 | | RXHP | 0 | POPT |
| 7000010 | 59 | PP | 3A | H | 4135 | 4135 | 4135 | 4131 | RXHP | 0 | PP |
| 7000011 | 23 | PO | 4B | L | 4220 | 4220 | 4220 | 4220 | RXHP | 0 | POPT |
| 7000012 | 40 | PO | 4B | M | | | 4220 | | RXHP | 0 | POPT |
| 7000013 | 42 | PP | 3B | M | | | 4220 | | RXHP | 0 | PP |
| 7000014 | 29 | PO | 4B | M | | | | | CRUSH | 0 | POPT |
| 7000015 | 70 | PO | 3B | M | | | 4220 | | CRUSH | 0 | POPT |
| 7000016 | 1 | GRA | 0 | 0 | | | | | | 0 | OTH |
| 7000017 | 14 | PO | 4B | M | | | 4220 | | RXHP | 0 | POPT |
| 7000018 | 9 | PO | 2A | M | 4143 | 4143 | 4143 | 4131 | RXHP | 0 | POPT |
| 7000019 | 58 | PO | 3A | M | | | 4230 | | RXHP | 0 | POPT |
| 7000020 | 31 | PO | 3A | H | | 4135 | 4135 | 4131 | CRUSH | 0 | POPT |

BAKER 10K MANAGEMENT ACTIVITY DATABASE 30-May-96

| LOC/SITE | AC | VEG | VSS | DMR | ALT1 | ALT2 | ALT3 | ALT6 | BURN | CHU | MSORP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7000021 | 28 | PO | 3C | M | | | | | CRUSH | 0 | POPT |
| 7000022 | 30 | PO | 4B | H | | | 4135 | | RXHP | 0 | POPT |
| 7000023 | 64 | PO | 4A | M | | | 4220 | | RXHP | 0 | POPT |
| 7000024 | 20 | PP | 4A | H | | 4135 | 4135 | 4131 | | 0 | PP |
| 7000025 | 43 | PP | 4A | M | | | | | RXHP | 2 | PP |
| 7000026 | 40 | PO | 3A | M | | | | | | 2 | POPT |
| 7000027 | 75 | PP | 4A | M | | | | | CRUSH | 2 | PP |
| 7000028 | 38 | PO | 3B | M | | | | | RXHP | 2 | POPT |
| 7000029 | 9 | PO | 3B | M | | | | | | 0 | POPT |

POCKET 10K HARVEST ACTIVITY DATABASE 30-May-96

| LOCSITE | AC | VEG | VSS | DMR | ALT1 | ALT2 | ALT3 | ALT6 | BURN | CHU | MSORP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6680001 | 64 | PP | 4CM | L | | | | | RXLP | 2 | PP |
| 6680002 | 61 | PO | 4BM | L | 4220 | 4220 | | 4220 | RXMP | 2 | PONP |
| 6680003 | 70 | PO | 4BM | M | | 4220 | | 4220 | HAZD | 2 | POPT |
| 6680004 | 43 | PO | 4CS | M | | | | | RXMP | 2 | PONP |
| 6680005 | 65 | PO | 4CM | L | | | | | RXMP | 2 | PONP |
| 6680006 | 11 | PO | 4CM | H | | | | | HAZD | 2 | POPT |
| 6680007 | 14 | PO | 3CM | M | | | | | HAZD | 2 | POPT |
| 6680008 | 37 | PO | 4CM | 0 | | | | | HAZD | 2 | PONP |
| 6680009 | 15 | PP | 4BM | L | | | | | RXLP | 2 | PP |
| 6680010 | 41 | PP | 3CM | H | | | | | RXLP | 2 | PP |
| 6680011 | 82 | PO | 3BM | M | | | | | | 2 | WITH |
| 6680012 | 141 | PP | 4CS | L | | | | | RXLP | 2 | PP |
| 6680013 | 22 | PO | 3CM | M | | | | | | 2 | WITH |
| 6680014 | 43 | PP | 3CM | L | | | | | RXLP | 2 | PP |
| 6680015 | 29 | PJ | PJ | 0 | | | | | | 2 | PJ |
| 6680016 | 155 | PO | 4CM | L | | | | | HAZD | 2 | PONP |
| 6680017 | 20 | PO | 4BM | 0 | | | | | | 2 | PO40 |
| 6680018 | 74 | PO | 4CM | L | | | | | | 2 | POPT |
| 6680019 | 11 | PO | 3AM | L | 4230 | 4230 | | | RXMP | 2 | PONP |
| 6680020 | 24 | PO | 5BM | M | | | | | HAZD | 2 | POPT |
| 6680021 | 49 | PO | 5AM | L | | | | | HAZD | 2 | POPT |
| 6680022 | 66 | PO | 4CM | M | | | | | RXHP | 2 | POPT |
| 6680023 | 30 | PO | 5BM | L | | | | | | 2 | PONP |
| 6680024 | 26 | PO | 4BM | M | | 4220 | | 4220 | RXMP | 2 | PONP |
| 6680025 | 41 | PO | 3BM | M | | 4220 | | 4220 | HAZD | 2 | PONP |
| 6680026 | 11 | PO | 4CM | M | | | | | HAZD | 2 | PONP |
| 6680027 | 22 | PO | 3BM | H | | | | | HAZD | 2 | PONP |
| 6680028 | 28 | PO | 3BM | L | | | | | | 2 | PO40 |
| 6680029 | 28 | PO | 4BM | H | 4135 | 4135 | | 4121 | RXMP | 2 | PONP |
| 6680030 | 13 | PP | 4CS | M | | | | | RXLP | 2 | PP |
| 6680032 | 16 | PO | 5BM | H | | | | | RXMP | 2 | PONP |
| 6700001 | 37 | MC | 4CM | M | | | | | RXLP | 2 | MC40 |
| 6700002 | 76 | PO | 4BM | H | 4135 | 4135 | | | | 2 | POPT |
| 6700003 | 68 | PP | 4BM | H | 4135 | 4135 | | | RXLP | 2 | PP |
| 6700004 | 88 | PP | 3CM | H | 4135 | 4135 | | | RXLP | 2 | PP |
| 6700005 | 47 | PP | 3BM | H | 4135 | 4135 | | | RXLP | 2 | PP |
| 6700006 | 7 | PO | 3CM | L | | | | | | 2 | POPT |
| 6700007 | 141 | PP | 3BM | M | | | | | RXLP | 2 | PP |
| 6700008 | 163 | MC | 3CM | L | | | | | | 2 | WITH |
| 6700009 | 18 | PP | 3AS | L | 4220 | 4220 | | | | 2 | PP |
| 6700010 | 24 | PP | 3BM | H | 4135 | 4135 | | | RXLP | 2 | PP |
| 6700011 | 38 | PP | 3BM | H | 4135 | 4135 | | | RXLP | 2 | PP |
| 6700012 | 59 | PP | 3BM | L | 4220 | 4220 | | | RXLP | 2 | PP |
| 6700013 | 52 | PP | 4BM | H | | | | | RXLP | 2 | PP |
| 6700014 | 35 | PP | 4AM | L | | | | | RXLP | 2 | PP |
| 6700015 | 197 | PP | 4AM | 0 | | | | | RXLP | 2 | PP |
| 6700016 | 5 | PP | 3CM | 0 | | | | | | 2 | PP |

POCKET 10K HARVEST ACTIVITY DATABASE 30-May-96

| LOCSITE | AC | VEG | VSS | DMR | ALT1 | ALT2 | ALT3 | ALT6 | BURN | CHU | MSORP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6700017 | 30 | PP | 3BM | H | | | | | RXLP | 2 | PP |
| 6700018 | 33 | PP | 4AM | 0 | | | | | RXLP | 2 | PP |
| 6700019 | 25 | PP | 3CM | L | | | | | RXLP | 2 | PP |
| 6700020 | 81 | PP | 3BM | M | | | | | RXLP | 2 | PP |
| 6700021 | 63 | PP | 4AM | 0 | | | | | RXLP | 2 | PP |
| 6700022 | 35 | PP | 3AM | 0 | | | | | RXLP | 2 | PP |
| 6700023 | 41 | PP | 3CM | L | | | | | RXLP | 2 | PP |
| 6700024 | 86 | PP | 5AM | H | | | | | RXLP | 2 | PP |
| 6700025 | 75 | PO | 4BM | L | | | | | | 2 | WITH |
| 6700026 | 124 | PP | 4CM | L | | | | | RXLP | 2 | PP |
| 6700027 | 146 | PP | 4BM | M | | | | | RXLP | 2 | PP |
| 6700028 | 28 | PP | 3BM | 0 | | | | | RXLP | 2 | PP |
| 6700029 | 53 | PP | 3AM | L | | | | | RXLP | 2 | PP |
| 6700030 | 70 | PP | 4AM | M | 4220 | 4220 | | | RXLP | 2 | PP |
| 6700031 | 25 | PP | 3CM | M | | | | | RXLP | 2 | PP |
| 6700032 | 43 | PP | 3AM | M | | | | | RXLP | 2 | PP |
| 6700034 | 47 | PO | 3BM | L | | | | | | 2 | PO40 |
| 6700035 | 63 | PP | 4AM | L | | | | | RXLP | 2 | PP |
| 6700036 | 47 | PO | 3BM | H | | | | | | 2 | WITH |
| 6700037 | 36 | PP | 3CM | 0 | | | | | RXLP | 2 | PP |
| 6700038 | 67 | PO | 3BM | 0 | | | | | RXMP | 2 | PONP |
| 6700039 | 61 | PO | 4CM | M | | | | 4220 | RXLP | 2 | POPT |
| 6700040 | 15 | PP | 3CM | L | | | | | RXLP | 2 | PP |
| 6710001 | 29 | PO | 4BS | L | 4220 | 4220 | | 4220 | RXMP | 2 | POPT |
| 6710002 | 85 | PO | 3AS | L | 4220 | 4220 | | 4220 | RXMP | 2 | PONP |
| 6710003 | 14 | PP | 3AS | L | 4230 | 4230 | | 4143 | RXMP | 2 | PP |
| 6710004 | 46 | PO | 3AS | L | 4220 | 4220 | | 4220 | RXMP | 2 | PONP |
| 6710005 | 39 | PO | 3AS | L | 4220 | 4220 | | | RXMP | 2 | PONP |
| 6710006 | 32 | PO | 4BM | M | | | | | RXHP | 2 | POPT |
| 6710007 | 63 | PO | 4BM | L | 4220 | 4220 | | 4220 | RXHP | 2 | POPT |
| 6710008 | 108 | PO | 4CM | L | | | | | RXMP | 2 | PONP |
| 6710009 | 58 | PO | 4AS | M | 4220 | 4220 | | 4220 | HAZD | 2 | PONP |
| 6710010 | 77 | PO | 3AS | M | 4220 | 4220 | | 4220 | HAZD | 2 | PONP |
| 6710011 | 28 | PO | 4AS | L | 4220 | 4220 | 4151 | | RXHP | 2 | POPT |
| 6710012 | 35 | PO | 4CM | M | | | | | | 2 | POPT |
| 6710013 | 28 | PO | 4BM | M | | 4220 | | 4220 | HAZD | 2 | POPT |
| 6710014 | 27 | PO | 3CM | H | | 4135 | | 4121 | HAZD | 2 | POPT |
| 6710015 | 28 | PO | 5CM | L | | | | | HAZD | 2 | POPT |
| 6710016 | 12 | PO | 4CS | 0 | | | | | RXMP | 2 | PONP |
| 6710017 | 39 | PO | 4AS | L | | | | | RXMP | 2 | PONP |
| 6710018 | 89 | PO | 3AS | M | 4220 | 4220 | | 4220 | RXMP | 2 | PONP |
| 6710019 | 65 | PO | 3CM | 0 | | | | | | 2 | PO40 |
| 6710020 | 20 | PO | 3BS | L | 4220 | 4220 | | 4121 | | 2 | POPT |
| 6710021 | 17 | PO | 4BS | H | | 4135 | | 4121 | | 2 | POPT |
| 6710022 | 31 | PO | 4BM | L | 4220 | 4220 | | | RXMP | 2 | POPT |
| 6710023 | 3 | GRA | 0 | 0 | | | | | | 2 | OTH |
| 6710024 | 11 | PO | 3AM | L | 4230 | 4230 | | 4220 | RXMP | 2 | POPT |

POCKET 10K HARVEST ACTIVITY DATABASE 30-May-96

| LOCSITE | AC | VEG | VSS | DMR | ALT1 | ALT2 | ALT3 | ALT6 | BURN | CHU | MSORP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6710025 | 21 | PO | 4AS | L | 4220 | 4220 | 4151 | 4220 | RXMP | 2 | PONP |
| 6710026 | 23 | PO | 3AS | L | 4230 | 4230 | | 4220 | | 2 | PONP |
| 6710027 | 9 | PO | 4AS | 0 | | | | | RXMP | 2 | PONP |
| 6710028 | 9 | PP | 4AS | L | 4230 | 4230 | | 4230 | RXHP | 2 | PP |
| 6710029 | 4 | GRA | 0 | 0 | | | | | | 2 | OTH |
| 6710030 | 11 | PO | 4AS | L | 4230 | 4230 | | | HAZD | 2 | POPT |
| 6710031 | 32 | PO | 3BM | L | 4220 | 4220 | | 4220 | HAZD | 2 | POPT |
| 6710032 | 16 | PO | 3BS | L | 4220 | 4220 | | 4220 | HAZD | 2 | POPT |
| 6710033 | 37 | PO | 3BM | H | | 4230 | | 4220 | HAZD | 2 | PONP |
| 6710034 | 30 | PO | 4BM | L | | | | | | 2 | POPT |
| 6710035 | 42 | PO | 3CM | M | | | | | HAZD | 2 | POPT |
| 6710036 | 5 | PO | 4CM | L | | | | | HAZD | 2 | PO40 |
| 6710037 | 21 | PO | 3AS | L | 4230 | 4230 | | 4220 | HAZD | 2 | PONP |
| 6710038 | 24 | PO | 3BM | L | 4220 | 4220 | | 4121 | RXMP | 2 | POPT |
| 6710039 | 22 | PO | 3AS | M | 4220 | 4220 | | 4220 | HAZD | 2 | POPT |
| 6710040 | 47 | PO | 3AS | L | 4230 | 4230 | | | RXMP | 2 | PONP |
| 6710041 | 18 | PO | 3AS | H | | 4135 | | 4121 | | 2 | POPT |
| 6710042 | 14 | PO | 4AM | M | 4220 | 4220 | | 4220 | HAZD | 2 | POPT |
| 6710043 | 13 | PO | 3BM | M | | 4220 | | 4121 | | 2 | POPT |
| 6810001 | 50 | PP | 6CM | M | | | | | RXHP | 2 | PP |
| 6810002 | 15 | PO | 4BM | M | | | | | RXMP | 2 | PO40 |
| 6810003 | 21 | PP | 5CM | M | | | | | RXHP | 2 | PP |
| 6810004 | 48 | PP | 4BS | M | | | | | RXHP | 2 | PP |
| 6810005 | 23 | PP | 3AM | L | 4220 | 4220 | 4151 | | RXHP | 2 | PP |
| 6810006 | 51 | PP | 4BM | M | | | | | RXHP | 2 | PP |
| 6810007 | 61 | PP | 4BM | L | | | | | RXHP | 2 | PP |
| 6810008 | 20 | PP | 4AM | M | 4220 | 4220 | | | RXHP | 2 | PP |
| 6810009 | 16 | PO | 3BS | M | | 4220 | | 4220 | RXMP | 2 | POPT |
| 6810010 | 18 | PO | 3BS | M | | 4220 | | 4220 | RXMP | 2 | POPT |
| 6810011 | 19 | PO | 4BS | L | 4220 | 4220 | 4151 | 4220 | RXHP | 2 | POPT |
| 6810012 | 30 | PP | 3CM | L | 4220 | 4220 | 4151 | | RXHP | 2 | PP |
| 6810013 | 18 | PO | 5CM | L | | | | | RXHP | 2 | PONP |
| 6810014 | 43 | PP | 5BM | L | | | | | RXHP | 2 | PP |
| 6810015 | 77 | PO | 4CM | L | | | | | RXHP | 2 | PONP |
| 6810016 | 8 | PP | 5CM | L | | | | | RXHP | 2 | PP |
| 6810017 | 32 | PP | 3BS | M | | 4220 | | 4220 | RXHP | 2 | PP |
| 6810018 | 27 | PP | 4CM | M | | | | | | 2 | PP |
| 6810019 | 28 | PP | 3BS | L | 4220 | 4220 | 4151 | 4220 | | 2 | PP |
| 6810020 | 15 | PO | 3AS | L | 4220 | 4220 | | 4220 | RXHP | 2 | PONP |
| 6810021 | 9 | PP | 3BS | L | 4220 | 4220 | 4151 | | RXHP | 2 | PP |
| 6810022 | 32 | PO | 3BS | M | | 4220 | | 4220 | RXHP | 2 | POPT |
| 6810023 | 18 | PO | 4BS | M | | 4220 | | 4220 | RXHP | 2 | PONP |
| 6810024 | 8 | PP | 1 | 0 | | | | | RXHP | 2 | PP |
| 6810025 | 38 | PO | 4BS | M | | 4220 | | 4220 | RXHP | 2 | PONP |
| 6810026 | 21 | PO | 3AM | L | | | | | HAZD | 2 | PONP |
| 6810027 | 64 | PO | 3BS | M | | 4220 | | 4220 | RXHP | 2 | PONP |
| 6810028 | 28 | PO | 3BM | M | | 4220 | | 4220 | | 2 | POPT |

POCKET 10K HARVEST ACTIVITY DATABASE 30-May-96

| LOCSITE | AC | VEG | VSS | DMR | ALT1 | ALT2 | ALT3 | ALT6 | BURN | CHU | MSORP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6810029 | 9 | PO | 5AM | M | | | | | RXHP | 2 | PONP |
| 6810030 | 42 | PO | 4AM | L | 4220 | 4220 | 4151 | 4220 | RXHP | 2 | PONP |
| 6810031 | 22 | PP | 3BM | M | | 4220 | | | RXLP | 2 | PP |
| 6810032 | 46 | PO | 4BS | M | | 4220 | | 4220 | HAZD | 2 | PONP |
| 6810033 | 29 | PO | 4AS | M | 4220 | 4220 | | 4220 | HAZD | 2 | PONP |
| 6810034 | 23 | PO | 5AM | M | | | | | HAZD | 2 | PONP |
| 6810035 | 6 | PO | 4CM | L | | | | | HAZD | 2 | PONP |
| 6810036 | 35 | PO | 3CM | M | | | | | HAZD | 2 | PONP |
| 6810037 | 14 | PP | 3BM | M | | | | | HAZD | 2 | PP |
| 6810038 | 15 | PO | 3BM | M | | 4220 | | 4220 | RXHP | 2 | PONP |
| 6810039 | 13 | PP | 3BM | L | | | | | RXHP | 2 | PP |
| 6810040 | 28 | PO | 3AM | M | 4220 | 4220 | | 4220 | RXHP | 2 | PONP |
| 6810041 | 15 | PO | 3AM | M | 4220 | 4220 | | | HAZD | 2 | PONP |
| 6810042 | 18 | PO | 3AS | L | 4220 | 4220 | | 4220 | RXHP | 2 | PONP |
| 6810043 | 22 | PO | 4CM | H | | | | | RXMP | 2 | POPT |
| 6810044 | 13 | PO | 3AM | M | 4220 | 4220 | | 4220 | RXHP | 2 | PONP |
| 6810045 | 18 | PO | 3BS | M | | 4220 | | 4220 | RXHP | 2 | PONP |
| 6810046 | 6 | PO | 4AM | L | 4220 | 4220 | | 4121 | RXMP | 2 | POPT |
| 6810047 | 21 | PO | 3BS | L | 4220 | 4220 | 4151 | 4220 | RXHP | 2 | PONP |
| 6810048 | 19 | PP | 3BS | L | 4220 | 4220 | 4151 | | RXHP | 2 | PP |
| 6810049 | 17 | PP | 3AM | L | 4220 | 4220 | | | RXHP | 2 | PP |
| 6810050 | 12 | PO | 3AM | H | | | | | RXMP | 2 | PO40 |
| 6810051 | 12 | PP | 3AM | M | 4220 | 4220 | | | RXHP | 2 | PP |
| 6810052 | 15 | PO | 4BS | M | | 4220 | | 4121 | RXMP | 2 | POPT |
| 6810053 | 13 | PP | 6CM | M | | | | | RXHP | 2 | PP |
| 6820001 | 52 | PP | 3AM | 0 | | | | | RXLP | 2 | PP |
| 6820002 | 41 | PP | 4BM | 0 | | | | | RXLP | 2 | PP |
| 6820003 | 72 | PJ | PJ | 0 | | | | | | 0 | PJ |
| 6820004 | 36 | PP | 3AM | L | | | | | RXLP | 2 | PP |
| 6820005 | 131 | PP | 3CM | L | | | | | RXLP | 0 | PP |
| 6820006 | 18 | PP | 3BM | L | | | | | RXLP | 0 | PP |
| 6820007 | 39 | PP | 3AS | L | | | | | RXLP | 0 | PP |
| 6820008 | 102 | PP | 3AM | H | | | | | RXLP | 0 | PP |
| 6820009 | 2 | GRA | 0 | 0 | | | | | RXLP | 0 | OTH |
| 6820010 | 65 | PJ | PJ | 0 | | | | | | 0 | PJ |
| 6820011 | 12 | PP | 3AS | L | | | | | RXLP | 0 | PP |
| 6820012 | 51 | PP | 3AS | H | | | | | | 0 | PP |
| 6820013 | 98 | PP | 3AM | H | | | | | RXLP | 0 | PP |
| 6820014 | 214 | PP | 3AM | H | | | | | RXLP | 0 | PP |
| 6820015 | 25 | PP | 3AM | 0 | | | | | RXLP | 0 | PP |
| 6820016 | 64 | PP | 3BM | H | | | | | RXLP | 0 | PP |
| 6820017 | 6 | PJ | PJ | 0 | | | | | | 0 | PJ |
| 6820018 | 234 | PJ | PJ | 0 | | | | | | 0 | PJ |
| 6820019 | 56 | PJ | PJ | 0 | | | | | | 0 | PJ |
| 6820020 | 6 | PP | 3BM | 0 | | | | | RXLP | 0 | PP |
| 6820021 | 26 | PJ | PJ | 0 | | | | | | 0 | PJ |
| 6820022 | 24 | PP | 3AM | 0 | | | | | RXLP | 0 | PP |

POCKET 10K HARVEST ACTIVITY DATABASE 30-May-96

| LOCSITE | AC | VEG | VSS | DMR | ALT1 | ALT2 | ALT3 | ALT6 | BURN | CHU | MSORP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6820023 | 43 | PP | 3AS | H | | | | | RXLP | 0 | PP |
| 6820024 | 54 | PP | 3AS | L | | | | | RXLP | 0 | PP |
| 6830001 | 34 | PP | 4BM | M | | | | | HAZD | 2 | PP |
| 6830002 | 123 | PP | 5AM | L | | | | | HAZD | 2 | PP |
| 6830003 | 48 | PP | 4AM | H | 4135 | 4135 | | | HAZD | 2 | PP |
| 6830004 | 87 | PO | 4CM | L | | | | | HAZD | 2 | PONP |
| 6830005 | 94 | PP | 5CM | M | | | | | HAZD | 2 | PP |
| 6830006 | 85 | PP | 4BM | M | | | | | RXLP | 2 | PP |
| 6830007 | 76 | PO | 5CM | L | | | | | RXHP | 2 | PONP |
| 6830008 | 39 | PP | 5BM | L | | | | | RXHP | 2 | PP |
| 6830009 | 79 | PO | 5BM | H | | | | | RXHP | 2 | PONP |
| 6830010 | 39 | PO | 5BM | L | | | | | RXHP | 2 | PONP |
| 6830011 | 30 | PO | 5BM | L | | | | | RXHP | 2 | PONP |
| 6830012 | 39 | PO | 5BM | L | | | | | HAZD | 2 | PONP |
| 6830013 | 98 | PO | 4CM | H | | | | | RXHP | 2 | PONP |
| 6840001 | 7 | PP | 2A | 0 | | | | | RXLP | 0 | PP |
| 6840002 | 24 | PP | 3AM | H | | | | | RXLP | 0 | PP |
| 6840003 | 35 | PP | 3AS | 0 | | | | | RXLP | 0 | PP |
| 6840004 | 39 | PP | 3AM | H | | | | | RXLP | 0 | PP |
| 6840005 | 21 | PP | 3BM | L | 4220 | 4220 | 4220 | | RXLP | 0 | PP |
| 6840006 | 20 | PP | 2A | 0 | | | | | RXLP | 0 | PP |
| 6840007 | 92 | PP | 4CM | L | | | | | HAZD | 0 | PP |
| 6840008 | 18 | PP | 3AM | L | | | | | HAZD | 0 | PP |
| 6840009 | 43 | PP | 4CM | 0 | | | | | RXLP | 0 | PP |
| 6840010 | 21 | PP | 3AM | H | | | | | RXLP | 0 | PP |
| 6840011 | 101 | PP | 4AM | M | | | | | HAZD | 0 | PP |
| 6840012 | 43 | PP | 4AM | H | | | | | HAZD | 0 | PP |
| 6840013 | 50 | PP | 5BM | M | | | | | HAZD | 0 | PP |
| 6840014 | 72 | PP | 5AM | M | | | | | HAZD | 0 | PP |
| 6840015 | 81 | PP | 4AM | M | | | | | HAZD | 0 | PP |
| 6840016 | 69 | PP | 5BM | L | | | | | HAZD | 2 | PP |
| 6840017 | 103 | PP | 5AM | M | | | | | RXLP | 2 | PP |
| 6840018 | 37 | PO | 5BM | L | | | | | HAZD | 2 | PONP |
| 6840019 | 78 | PO | 4AM | M | | | | | | 2 | PONP |
| 6840020 | 26 | PP | 3AM | H | | | | | RXLP | 2 | PP |
| 6840021 | 44 | PO | 5BM | L | | | | | HAZD | 2 | PONP |
| 6840022 | 20 | PP | 4BM | M | | | | | HAZD | 2 | PP |
| 6840023 | 30 | PP | 4CM | L | | | | | HAZD | 2 | PP |
| 6840024 | 46 | PP | 4BS | L | 4230 | 4230 | 4230 | | RXLP | 0 | PP |
| 6850001 | 83 | PP | 4BM | L | | | | | HAZD | 2 | PP |
| 6850002 | 83 | PP | 4BM | L | | | | | HAZD | 2 | PP |
| 6850003 | 36 | PP | 5AM | M | | | | | HAZD | 2 | PP |
| 6850004 | 96 | PO | 4BM | L | 4220 | 4220 | 4151 | 4220 | HAZD | 2 | POPT |
| 6850005 | 126 | PO | 3AM | M | | | | | HAZD | 2 | PONP |
| 6850006 | 70 | PP | 3BM | M | | | | | HAZD | 2 | PP |
| 6850007 | 20 | PP | 3AM | M | | | | | RXLP | 2 | PP |
| 6850008 | 65 | PP | 5AM | M | | | | | HAZD | 2 | PP |

POCKET 10K HARVEST ACTIVITY DATABASE 30-May-96

| LOCSITE | AC | VEG | VSS | DMR | ALT1 | ALT2 | ALT3 | ALT6 | BURN | CHU | MSORP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6850009 | 82 | PP | 4AS | M | | | | | HAZD | 2 | PP |
| 6850010 | 82 | PP | 3AM | M | | | | | RXLP | 2 | PP |
| 6850011 | 31 | PP | 3AM | M | | | | | RXLP | 2 | PP |
| 6850012 | 56 | PP | 3AM | M | | | | | HAZD | 2 | PP |
| 6850013 | 90 | PP | 3AM | M | | | | | HAZD | 2 | PP |
| 6850014 | 28 | PP | 3AM | M | | | | | HAZD | 2 | PP |
| 6850015 | 9 | PP | 3AM | H | | | | | HAZD | 2 | PP |
| 6850016 | 53 | PO | 3BM | M | | 4220 | | 4220 | HAZD | 2 | PONP |
| 6850017 | 123 | PP | 3AS | M | | | | | RXLP | 2 | PP |
| 6850018 | 50 | PO | 4AM | L | 4220 | 4220 | | 4220 | HAZD | 2 | POPT |
| 6850019 | 62 | PO | 3BM | M | | 4220 | | 4220 | HAZD | 2 | PONP |
| 6850020 | 69 | PO | 4BM | L | 4220 | 4220 | | 4220 | HAZD | 2 | PONP |
| 6850021 | 88 | PP | 3BM | M | | | | | HAZD | 2 | PP |
| 6850022 | 47 | PP | 2A | M | | | | | | 2 | PP |
| 6850023 | 52 | PP | 3AM | M | | | | | HAZD | 2 | PP |
| 6850024 | 35 | PP | 5AM | L | | | | | HAZD | 2 | PP |

**BAKER 10K ROADS**
**EXISTING RA/TM DECISIONS**

| ROAD NUMBER | OPEN LENGTH | CLOSE LENGTH | OBLIT LENGTH | TIS LENGTH | REMARKS/ COMMENTS |
|---|---|---|---|---|---|
| 149 | 4.5 | | | | watershed concerns |
| 149A | | | 1.4 | 1.5 | watershed concerns |
| 149B | | | 0.2 | 0.5 | watershed concerns |
| 149C | | | 0.2 | 0.4 | |
| 149D | | | 0.4 | 0.5 | |
| 218 | 3.1 | | | 5.2 | |
| 300 | 3.8 | | | | jct 87 to jct 218 |
| 300B | | 0.4 | | | gated closure to L.O. |
| 604A | | | 0.6 | | |
| 607 | 1.4 | | | | |
| 613 | 2.6 | | | | |
| 613A | | | 0.8 | | |
| 616 | 5.5 | | | | |
| 6020 | | 0.6 | | | |
| 6021 | | 0.4 | | | watershed concerns |
| 6022 | | 0.6 | | | watershed concerns |
| 6023 | | 0.5 | | | watershed concerns |
| 6024 | | 0.5 | | | |
| 6030 | | 0.3 | | | watershed concerns; gate closure; fire access |
| 6031 | | 0.9 | | 0.8 | |
| 6032 | | 0.7 | | 0.5 | |
| 6033 | 0.8 | | | 1.0 | watershed concerns |
| 6038 | | | 0.3 | 0.4 | |
| 6039 | | 0.4 | | 0.3 | |
| 6084 | | 0.4 | | | |
| 6152 | | | 0.3 | | |
| 6304 | 1.9 | | | 2.1 | watershed concerns |
| 6305 | 1.2 | | | | |
| 6306 | 1.1 | | | 1.4 | |
| 6419 | 0.3 | | | | |
| 6420 | 0.3 | | | | |
| 9362T | 1.5 | 1.0 | | 2.0 | fire/rec access denied if closed; watershed concerns |
| 9363S | 1.2 | | | | |
| 9381F | | 0.4 | | | |
| 9381L | 1.1 | | | | |
| 9381M | | 0.3 | | 0.4 | |
| 9381P | | 0.3 | | | |
| 9382G | 1.4 | | | | |
| 9382L | 0.5 | | | | watershed concerns |
| 9382P | | | 0.5 | | |
| 9382R | | 0.3 | | | watershed concerns |
| 9383L | 0.4 | | | 0.5 | winter play park area |
| 9383N | 0.8 | | | | |

**BAKER 10K ROADS**
**EXISTING RA/TM DECISIONS**

| ROAD NUMBER | OPEN LENGTH | CLOSE LENGTH | OBLIT LENGTH | TIS LENGTH | REMARKS/ COMMENTS |
|---|---|---|---|---|---|
| 9384L | 0.4 | | | | |
| 9384M | 0.4 | | | | watershed concerns |
| 9384N | | 0.4 | | | gated closure; fire access |
| 9384P | | | 0.3 | | |
| 9384Q | | | 0.5 | 0.3 | |
| 9384R | | | 0.3 | | |
| 9384V | | | 0.3 | | |
| 9384W | | | 0.3 | | |
| 9384X | | | 0.6 | | |
| 9385 | 1.8 | | | 2.3 | watershed concerns |
| 9385B | | 0.5 | | | gated closure; fire access |
| 9385E | 0.6 | | | | |
| 9385H | | 0.6 | | 1.0 | |
| 9385L | 0.1 | | | | |
| 9385M | | | 0.2 | | |
| 9385N | 2.1 | | | | watershed cncerns |
| 9385P | 0.3 | | | | |
| 9385Q | 0.2 | | | | |
| 9385R | | | 0.5 | | |
| 9385S | | | 0.7 | | |
| 9385U | 0.2 | | | | |
| 9385V | 0.3 | | | | |
| 9385W | 0.4 | | | | |
| 9385X | | | 0.3 | | |
| 9385Y | | | 0.1 | | |
| 9386E | | | 0.4 | 0.5 | |
| 9386H | 1.8 | | | 2.0 | |
| 9386M | 1.2 | | | 1.4 | watershed concerns |
| 9386N | | | 0.3 | | oblit complete |
| 9386P | | | 0.2 | | |
| 9386Q | | | 0.2 | | |
| 9386R | | | 0.2 | | |
| 9386S | | | 0.3 | | watershed concerns |
| 9386T | | | 0.6 | | watershed concerns |
| 9386U | | | 0.7 | | |
| 9386V | 0.1 | | | | |
| 9386W | 0.5 | | | | |
| 9386Y | 0.1 | | | | |
| 9387E | | 0.7 | | 1.2 | |
| 9387F | | 0.9 | | 0.7 | |
| 9387M | | 0.2 | | 0.7 | |
| 9388F | | 1.2 | | | |
| 9388H | | 0.3 | | | |
| 9388L | | 0.1 | | 0.3 | watershed concerns |
| 9388M | | 0.8 | | 0.2 | |

**BAKER 10K ROADS**
**EXISTING RA/TM DECISIONS**

| ROAD NUMBER | OPEN LENGTH | CLOSE LENGTH | OBLIT LENGTH | TIS LENGTH | REMARKS/ COMMENTS |
|---|---|---|---|---|---|
| 9388N | 1.0 | | | 1.1 | |
| 9388T | 0.1 | | | | |
| 9388V | 0.6 | | | | |
| 9388X | | | 0.2 | | |
| 9389E | 0.5 | | | 1.1 | |
| 9389F | | 0.3 | | | |
| 9389M | | 0.4 | | | |
| 9389N | | 0.5 | | | |
| 9389P | | 0.4 | | 0.3 | |
| 9389R | | 0.2 | | | |
| 9389S | | 0.4 | | 0.4 | |
| nonum1 | | 0.2 | | | |
| nonum3 | | | 0.3 | | |

**BAKER 10K ROADS**
**PROPOSED RA/TM CHANGES/ADDITIONS**

| ROAD NUMBER | OPEN LENGTH | CLOSE LENGTH | OBLIT LENGTH | TIS LENGTH | REMARKS/ COMMENTS |
|---|---|---|---|---|---|
| 613A | 0.8 | | | | open for fire/rec access |
| 6304 | | | 1.9 | | watershed concerns |
| 9382G | | 1.4 | | | watershed concerns; future timber access |
| 9383L | | 0.4 | | | watershed concerns |
| 9384P | | 0.3 | | | future timber access |
| 9384Q | | 0.5 | | | future access |
| 9384R | 0.3 | | | | open during 10 yr burning |
| 9384V | 0.3 | | | | open during 10 yr burning |
| 9384W | 0.3 | | | | open during 10 yr burning |
| 9385R | | 0.5 | | | future timber access |
| 9385S | | 0.7 | | | future timber access |
| 9385X | | 0.3 | | | future timber access |
| 9385Y | | 0.1 | | | future timber access |
| 9388N | | | 1.0 | | watershed concerns |
| 9389E | | | 0.5 | | watershed concerns |

## POCKET 10K ROADS
## EXISTING RA/TM DECISIONS

| ROAD NUMBER | OPEN LENGTH | CLOSE LENGTH | OBLIT LENGTH | TIS LENGTH | REMARKS/ COMMENTS |
|---|---|---|---|---|---|
| 607A | 1.4 | | | 1.1 | |
| 608 | 2.4 | | | | |
| 609 | 4.0 | | | 4.1 | |
| 6175 | | 0.8 | | 0.7 | |
| 6177 | | | 0.2 | | |
| 6179 | | | 0.4 | | watershed concerns |
| 6180 | | | 0.3 | 0.2 | watershed concerns |
| 6181 | | | 0.2 | | owl |
| 6182 | | 0.2 | | | owl |
| 6183 | | | 0.4 | 0.2 | |
| 6186 | | | 0.1 | | |
| 6190 | | | 0.4 | | watershed concerns |
| 6191 | | | 0.3 | | |
| 6192 | | 0.4 | | | |
| 6193 | | | 0.3 | | |
| 6194 | | | 0.2 | | watershed concerns |
| 6195 | | | 0.3 | | watershed concerns |
| 6196 | | | 0.3 | 0.2 | watershed concerns |
| 6196A | | | 0.3 | | oblit @ 9387B done;need rest |
| 6196B | | | 0.3 | | |
| 6197 | | | 0.5 | | |
| 6198 | | | 0.3 | | oblit done; watershed concerns |
| 6200 | | 0.5 | | | closure done |
| 6203 | | | 0.2 | 0.1 | watershed concerns |
| 6204 | | | 0.2 | | watershed concerns |
| 6207 | | | 0.1 | | |
| 6208 | | | 0.3 | | closure done |
| 6209 | | | 0.3 | | watershed concerns |
| 9351S | | | 0.2 | | owl; watershed concerns |
| 9351T | | | 0.5 | 0.2 | watershed concerns |
| 9351U | | | 0.2 | 0.1 | owl; watershed concerns |
| 9351N | 0.3 | | | | open to radio towers |
| 9351N | | | 0.6 | | oblit beyond towers |
| 9351P | | 0.4 | | | owl |
| 9365R | 0.8 | | | 0.6 | |
| 9366R | 3.6 | | | 5.3 | |
| 9367R | 1.4 | | | 1.2 | watershed concerns |
| 9367V | | | 0.1 | 0.1 | not previously identified, watershed concerns |
| 9367W | | | 0.25 | 0.25 | not previously identified, watershed concerns |
| 9370A | | 0.5 | | 0.1 | |
| 9370B | | 0.1 | | 0.2 | |
| 9370C | | 0.4 | | 0.2 | |
| 9381 | 1.5 | | | | watershed concerns |
| 9381B | 0.7 | | | 1.1 | owl |
| 9381E | 0.8 | | | 0.9 | |
| 9382 | | 0.7 | | 0.8 | watershed concerns |
| 9382D | | | 0.2 | | owl |

POCKET 10K ROADS
EXISTING RA/TM DECISIONS

| ROAD NUMBER | OPEN LENGTH | CLOSE LENGTH | OBLIT LENGTH | TIS LENGTH | REMARKS/ COMMENTS |
|---|---|---|---|---|---|
| 9383 | | | 0.4 | | |
| 9383D | | | 0.4 | 0.5 | |
| 9383F | | 0.7 | | | |
| 9384 | 1.5 | | | 1.9 | watershed concerns |
| 9384A | 0.8 | | | 1.0 | watershed concerns |
| 9384D | 1.1 | | | | watershed concerns |
| 9384E | | 0.2 | | 0.2 | not previously identified, watershed concerns |
| 9384F | | 0.2 | | 0.2 | not previously identified, watershed concerns |
| 9384G | | | 0.2 | 0.2 | not previously identified, watershed concerns |
| 9384H | | | 0.2 | 0.2 | not previously identified, watershed concerns |
| 9385A | | | 1.0 | | watershed concerns |
| 9385C | | 1.5 | | 0.8 | owl; watershed concerns |
| 9385D | | | 0.4 | 0.6 | watershed concerns |
| 9386 | | 0.6 | | | |
| 9386A | | | 0.5 | 0.6 | |
| 9386B | | 0.4 | | | closure done |
| 9386C | | 0.1 | | 0.5 | owl |
| 9386D | | | 0.7 | | watershed concerns |
| 9387 | 1.1 | | | | watershed concerns |
| 9387B | 0.8/0.8 | | | 1.4 | sections not connected |
| 9387C | 2.3 | | | 1.4 | wet @ entrance |
| 9387D | | | 0.4 | | oblit done |
| 9387K | | | 0.2 | 0.2 | not previously identified, watershed concerns |
| 9387L | | | 0.25 | 0.25 | watershed concerns |
| 9387V | | | 0.4 | 0.4 | watershed concerns |
| 9387N | | | 0.2 | 0.2 | watershed concerns |
| 9387P | | | 0.2 | 0.2 | watershed concerns |
| 9387Q | | | 0.2 | 0.2 | watershed concerns |
| 9387R | | | 0.6 | 0.6 | watershed concerns |
| 9387S | | | 0.45 | 0.45 | watershed concern |
| 9387T | | | 0.1 | 0.1 | watershed concern |
| 9387W | | | 0.45 | 0.45 | watershed concerns |
| 9387X | | | 0.3 | 0.3 | watershed concerns |

## POCKET 10K ROADS
## PROPOSED RA/TM CHANGES/ADDITIONS

| ROAD NUMBER | OPEN LENGTH | CLOSE LENGTH | OBLIT LENGTH | TIS LENGTH | REMARKS/ COMMENTS |
|---|---|---|---|---|---|
| 9388 | | 0.5 | | | |
| 9388A | | 0.5 | | 0.4 | |
| 9388B | | 0.4 | | | closure done |
| 9388D | | | 0.9 | 0.4 | watershed concerns |
| 9388J | | | 0.4 | 0.4 | not previously identified, watershed concerns |
| 9388K | | | 0.1 | 0.1 | not previously identified, watershed concerns |
| 9388P | | 0.1 | | 0.1 | not previously identified, watershed concerns |
| 9388Q | | 0.2 | | 0.2 | not previously identified, watershed concerns |
| 9388R | | 0.3 | | 0.4 | watershed concerns |
| 9388S | | 0.1 | | 0.1 | not previously identified, watershed concerns |
| 9389 | | 1.3 | | 0.7 | |
| 9389A | | 0.4 | | 1.0 | |
| 9389B | | 1.1 | | 0.9 | |
| 9389C | 0.4 | | | | |
| 9389D | | 0.5 | | 0.6 | |
| 607A | 0.3 | | 1.1 | 1.1 | oblit to MP 1.1 for watershed; open beyond jct w/9381E |
| 608 | 2.4 | | | | open to jct w/9367R; temporary closure beyond jct for safety, archy & watershed concerns |
| 609 | 2.9 | | 1.1 | | open to meadow from hwy 87; oblit beyond for watershed concerns |
| 9351T | 0.5 | | | 0.2 | to vista w/seasonal closure for owl |
| 9366R | 3.3 | 0.3 | | 5.3 | close end/develop trailhead |
| 9381 | | | 1.5 | | watershed/safety |
| 9382 | | 0.1 | 0.6 | 0.8 | oblit beginning;tie ends into new proposed ridge route |
| 9384D | | | 1.1 | | watershed damage @ 5 mile lake |
| 9385A | | | 1.0 | | rough/not needed |
| 9386A | | 0.1 | 0.4 | 0.6 | oblit beginning;tie ends into new proposed ridge route |
| 9387 | 0.6 | | 0.5 | | oblit beyond 9388;rough/not nd |
| 9387C | 1.7 | | 0.6 | 1.4 | oblit from Hwy 87 to 9389C; watershed @ ent;adj access |
| 9389A | 0.4 | | | 1.0 | recreation needs |

**POCKET 10K ROADS**
**RECOMMENDED NEW CONSTRUCTION**

| ROAD NUMBER | LENGTH TO BE CONSTRUCTED | NEW TOTAL ROAD LENGTH | REMARKS/ COMMENTS |
|---|---|---|---|
| 9384A | 0.4 | 1.2 | connects roads 9384A and 9384, maintains access currently supplied by road 9381, scheduled for obliteration. |
| 9387B | 0.1 | 1.7 | connects two seperate sections of road 9387B, maintains accessto lower section currently supplied by road 6196, scheduled for obliteration. |
| 9381B | 0.3 | 1.0 | connects road 609 to 9381B to continue loop; need crossing constructed; sign as steepgrade or high clearance. |

TREE GROWTH - A SUMMARY OF TREE GROWTH TAKEN FROM DATA COLLECTED AT THE TAYLOR WOODS STUDY PLOTS AS DISPLAYED IN Research Paper RM-262, "Growth of Ponderosa Pine Thinned to Different Stocking Levels in Northern Arizona". 1/

| GSL | PLOT# | TREES/ ACRE | AVG. DBH (1972) 2/ | AVG. DBH (1982) | BA/ACRE (1972) | BA/ACRE (1982) | PERIODIC ANNUAL GROWTH ("DBH) | ESTIMATED ADDITIONAL YEARS TO GROW A TREE TO 18" DBH 3/ |
|---|---|---|---|---|---|---|---|---|
| 30 | 7 | 63 | 9.3 | 12.1 | 30 | 50 | 0.28 | 28 |
| 30 | 16 | 53 | 10.2 | 13.1 | 30 | 50 | 0.30 | 16 |
| 30 | 18 | 67 | 9.1 | 11.9 | 31 | 50 | 0.28 | 22 |
| 60 | 3 | 141 | 8.5 | 10.5 | 55 | 86 | 0.21 | 36 |
| 60 | 15 | 144 | 8.6 | 10.6 | 58 | 88 | 0.21 | 35 |
| 60 | 17 | 133 | 9.0 | 10.9 | 59 | 84 | 0.19 | 37 |
| 80 | 6 | 220 | 7.7 | 9.1 | 70 | 100 | 0.15 | 59 |
| 80 | 11 | 187 | 8.6 | 10.1 | 76 | 100 | 0.15 | 53 |
| 80 | 14 | 207 | 8.1 | 9.8 | 74 | 106 | 0.17 | 48 |
| 100 | 1 | 264 | 7.9 | 9.2 | 90 | 121 | 0.13 | 68 |
| 100 | 9 | 308 | 7.0 | 8.4 | 83 | 118 | 0.13 | 74 |
| 100 | 13 | 283 | 7.5 | 8.8 | 86 | 117 | 0.13 | 71 |
| 120 | 2 | 324 | 7.7 | 8.9 | 106 | 138 | 0.12 | 76 |
| 120 | 5 | 376 | 6.8 | 8.0 | 96 | 130 | 0.12 | 75 |
| 120 | 12 | 311 | 8.0 | 9.2 | 109 | 138 | 0.12 | 73 |
| 150 | 4 | 503 | 6.5 | 7.5 | 116 | 153 | 0.10 | 105 |
| 150 | 8 | 503 | 6.5 | 7.5 | 114 | 153 | 0.10 | 105 |
| 150 | 10 | 541 | 6.0 | 7.1 | 107 | 147 | 0.11 | 99 |

1/ This data was collected over a relatively small area with site index levels being fairly constant. Over a 10k analysis area site indexes vary greatly and these do affect the rate of tree growth. It can be expected that sites with site indexes higher than the study area will experience higher growth rates, everything else being equal and sites with lower site indexes will experience lower growth rates.

2/ The original sample plots were established in areas with similar tree size class characteristics. The differences in average DBH between the differing GSL's is due to thinning from below leaving the largest trees with each treatment. With heavier thinnings, more of the smaller trees are removed, raising the average DBH of the leave trees. Lighter thinnings retain more of the smaller trees, lowering the average DBH.

3/ These numbers were not part of the Research Paper RM-262 but rather projections made by the author of this document using data from Research Paper RM-262. The number of years it takes to grow an 18" DBH tree is based on its size in 1982 and growing it at the average rate that it grew from 1972-1982. For this to be considered a reasonably accurate projection there must be an entry made every 10 years reducing the stocking to the BA/ACRE measured in 1972.

## APPENDIX F

## ACRONYMS And TERMS

| | |
|---|---|
| 10K | 10,000 acre unit; basic planning unit defined in the Forest Plan |
| 20K | combination of two 10K's |
| ADEQ | Arizona Department of Environmental Quality |
| ADOT | Arizona Department of Transportation |
| BA | basal area; the amount of square feet per acre |
| DBH | diameter at breast height; standard level to measure diameter on trees |
| DM | dwarf mistletoe |
| DMR | dwarf mistletoe rating |
| EIS | environmental impact statement |
| FEIS | final environmental impact statement |
| FR | forest road |
| MA | management area; the basic division of land area for implementation of the Forest Plan |
| MBF | thousand board feet |
| MMBF | million board feet (thousand-thousand) |
| MSO | Mexican spotted owl |
| MT | management territory; nest area plus roosting area for the Mexican spotted owl; old terminology replaced with PAC under the Recovery Plan |
| NEPA | National Environmental Policy Act; governs analysis and disclosures of land management activities for the Forest Service |
| OHV | off-highway vehicle |
| PAC | protected activity center; habitat type for the Mexican spotted owl as defined by the MSO Recovery Plan |
| Q-Factor | a numerical figure between 1 and 2 that indicates the ratio of small to large trees (among other things); 1.1 describes a treatment that will retain more larger than smaller trees, while 1.4 indicates a greater level of smaller trees |
| RATM | resource access/travel management; describes level of road maintenance |
| ROS | recreation opportunity spectrum; system that describes range of recreational experiences |
| TES | terrestrial ecosystem survey |
| TE&S | threatened, endangered, and sensitive species |
| VQO | visual quality objective |
| VSS | vegetation stand structure (see page 34) |

## GLOSSARY OF ECOSYSTEM MANAGEMENT TERMS

**Biodiversity:** the variety of life and its processes, including the variety in genes, species, ecosystems, and the ecological processes that connect everything in ecosystems.

**Clump*:** a group (up to several acres) of similar characteristics (i.e. species composition, size, age) more definitive than a stand (District Silviculturist).

**Disturbance:** a discrete event, either natural or human induced, that causes a change in the existing condition of an ecological system.

**Ecological Approach:** natural resource planning and management activities that assure consideration of the relationships among all organisms (including humans) and their environment.

**Ecosystem:** living organisms interacting with each other and with their physical environment, usually described as an area for which it is meaningful to address these interrelationships.

**Ecosystem Management:** the use of an ecological approach that blends social, physical, economic, and biological needs and values to assure productive, healthy ecosystems.

**Ecosystem Sustainability:** the ability to sustain diversity, productivity, resilience to stress, health, renewability, and/or yield of desired values, resource uses, products, or services from an ecosystem while maintaining the integrity of the ecosystem over time (see also page 1-2).

**Healthy Ecosystem:** an ecosystem in which structure and functions allow the maintenance of the desired condition of biological diversity, biotic integrity, and ecological processes over time (see also page 1-2).

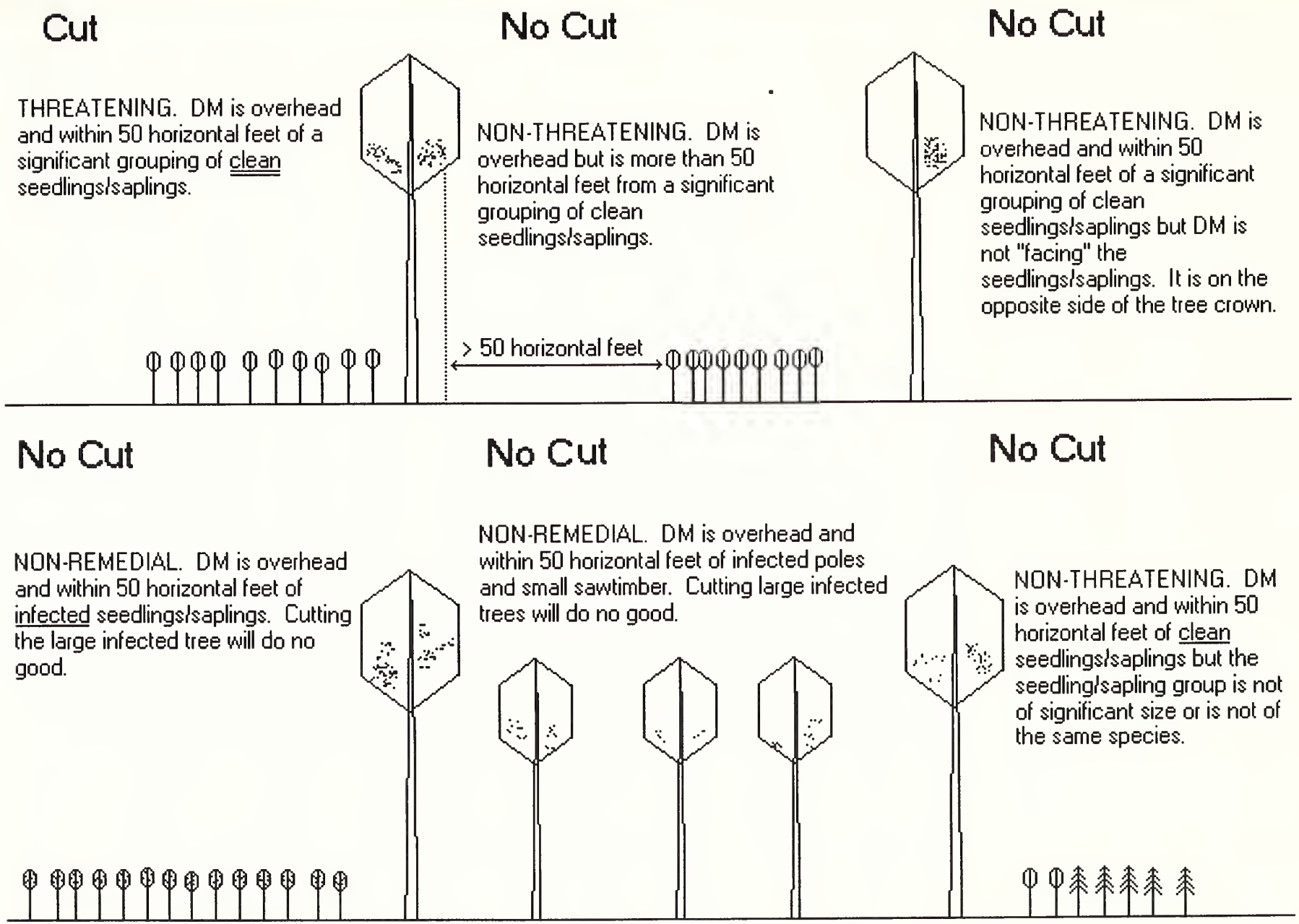
**Landscape:** an area composed of interacting ecosystems that are repeated because of geology, land form, soils, climate, biota, and human influences throughout the area. Landscapes are generally of a size, shape and pattern which is determined by interacting ecosystems.

**Natural Disturbance:** periodic impact of natural events such as fire, severe drought, insect or disease attack, or wind.

**Resilience:** the ability of an ecosystem to maintain the desired condition of diversity, integrity, and ecological processes following disturbance.

**Site (stand)*:** a plant community sufficiently uniform in cover type, age class, risk class, vigor, size class to be distinguishable from adjacent communities thus forming an individual management or silvicultural unit. Most commonly used when referring to forested areas (Coconino Forest Plan).

Unless noted with an asterisk (*) definitions are from: USDA Forest Service. 1994. Merrill R. Kaufman et al. eds. An ecological basis for ecosystem management. Gen. Tech. Rept. RM-246.


Cut
THREATENING. DM is overhead and within 50 horizontal feet of a significant grouping of clean seedlings/saplings.
No Cut
NON-THREATENING. DM is overhead but is more than 50 horizontal feet from a significant grouping of clean seedlings/saplings.
> 50 horizontal feet
No Cut
NON-THREATENING. DM is overhead and within 50 horizontal feet of a significant grouping of clean seedlings/saplings but DM is not "facing" the seedlings/saplings. It is on the opposite side of the tree crown.
No Cut
NON-REMEDIAL. DM is overhead and within 50 horizontal feet of infected seedlings/saplings. Cutting the large infected tree will do no good.
No Cut
NON-REMEDIAL. DM is overhead and within 50 horizontal feet of infected poles and small sawtimber. Cutting large infected trees will do no good.
No Cut
NON-THREATENING. DM is overhead and within 50 horizontal feet of clean seedlings/saplings but the seedling/sapling group is not of significant size or is not of the same species.

# INDEX

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# V



# W

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